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STATE OF NEVADA

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PDR
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Executive Director



**AGENCY FOR NUCLEAR PROJECTS
NUCLEAR WASTE PROJECT OFFICE**

Capitol Complex
Carson City, Nevada 89710
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November 17, 1987

Mr. Robert E. Browning
Waste Management Division
Office of Nuclear Material
Safety and Safeguard
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Browning:

Enclosed please find our Report entitled "Environmental Program Planning for the Proposed High-Level Nuclear Waste Repository at Yucca Mountain, Nevada." I hope that you find the Report informative regarding the Department of Energy's environmental track record at Yucca Mountain.

Should you have any questions, please do not hesitate to contact me.

Sincerely,

Robert R. Loux
Executive Director

RRL:njc

Enclosure

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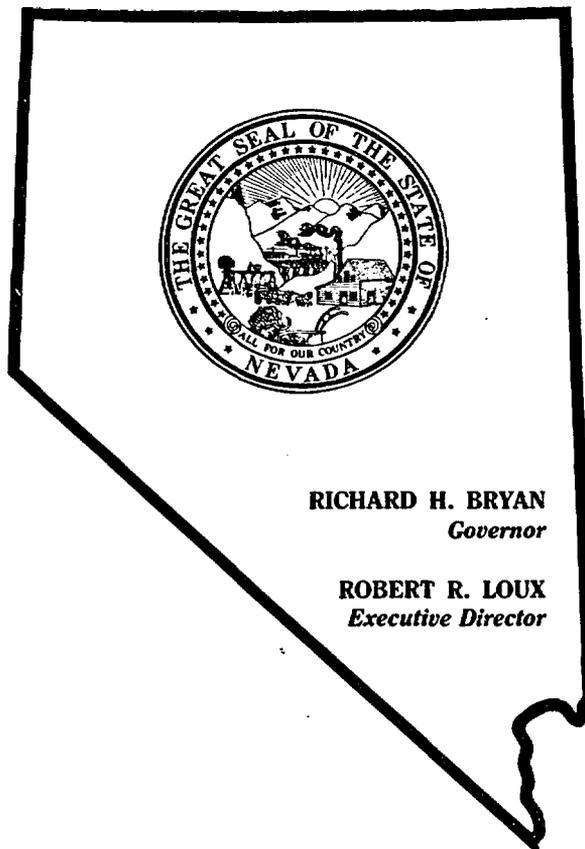
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STATE OF NEVADA
**AGENCY FOR NUCLEAR PROJECTS/
NUCLEAR WASTE PROJECT OFFICE**



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October 23, 1987

Mr. Carl P. Gertz, Project Manager
Waste Management Project Office
U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, Nevada 89193

Dear Mr. Gertz:

Enclosed for review are two copies of "Environmental Program Planning for the Proposed High-Level Nuclear Waste Repository at Yucca Mountain, Nevada" (NWPO-TR-001-87, August 1987). The report is scheduled for release by this Office on November 9, 1987.

Please call me if there are questions regarding this matter.

Sincerely,

A handwritten signature in cursive script, appearing to read "Robert R. Loux".

Robert R. Loux
Executive Director

RL/CM/gjb

Enclosures

*93-001
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Department of Energy

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NOV 6 1987



Robert R. Loux, Jr., Executive Director
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GENERAL COMMENTS ON THE NEVADA ENVIRONMENTAL PROGRAM PLAN

We appreciate the opportunity to provide some general observations on the document entitled Environmental Program Planning for the Proposed High-Level Nuclear Waste Repository at Yucca Mountain, Nevada, August 1987 (NWPO-TR-001-87).

Our review indicates that your document does not reflect the current information on our environmental program. Although your, August 1987, document may reflect our program as you understood it at that time, you are aware that additional program documents are being prepared which will, in our opinion, enable you to see our comprehensive, integrated environmental program. This information was covered at the September 1987, Environmental Coordinating Group meeting. We recognize that you do not have copies, nor have you had the opportunity to review these documents, and therefore, you could draw the conclusion that the development of the Department of Energy environmental program might be considered "piece-meal planning." However, it is felt that once you review all of the documents and have an opportunity to discuss these documents with us, you will see that we have a comprehensive integrated program for environmental protection. Therefore, it is believed that if we can improve our communications by meeting together to discuss the concerns of mutual interest on a regular basis, we will be better able to understand the direction and rationale of our respective programs.

We look forward to meeting and discussing our respective programs with you and your staff at your convenience.



Carl P. Gertz, Project Manager
Waste Management Project Office

WMPO:RDK-377

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NWPO-TR-001-87

**ENVIRONMENTAL PROGRAM PLANNING
FOR THE PROPOSED HIGH-LEVEL
NUCLEAR WASTE REPOSITORY AT
YUCCA MOUNTAIN, NEVADA**

State of Nevada
Agency for Nuclear Projects/
Nuclear Waste Project Office
Carson City, Nevada

August 1987

The Nevada Nuclear Waste project Office was created by the Nevada Legislature to oversee federal high-level nuclear waste activities in the State. Since 1985, it has dealt largely with the U.S. Department of Energy's siting of a high-level nuclear waste repository at Yucca Mountain in southern Nevada. As part of its oversight role, the Nuclear Waste Project Office has contracted for studies of various technical questions at Yucca Mountain.

This study was funded by Department of Energy grant number DE-FG08-85-NV10461.

FOREWORD

Nevada is one of three states, along with Texas and Washington, designated by the U.S. Department of Energy (DOE) as candidate host states for the nation's first geologic repository for high-level nuclear wastes. The Nuclear Waste Policy Act of 1982 which authorized the DOE repository program made provisions for host states to oversee the projects in their individual states. Accordingly, the State of Nevada established the Nuclear Waste Project Office (NWPO) to review the DOE activities and to represent the interests of the State in that endeavor.

In the course of fulfilling its mandate the State has found it necessary that NWPO undertake independent studies. Among the issues to be addressed by the NWPO are the extent to which a sufficient understanding exists of potential impacts the repository project may have on socioeconomics, transportation, environmental quality, and related aspects of public health, safety, and welfare.

This report was prepared to illustrate the policy and actions that the State of Nevada believe are required to assure that the quality of the environment is adequately considered during the course of the DOE work at the proposed high-level nuclear waste repository at Yucca Mountain. The report describes the DOE environmental program and the studies planned by NWPO to reflect the State's position toward environmental protection.

Persons interested in learning more of the NWPO program with respect to technical and socioeconomic issues should contact:

Nuclear Waste Project Office
Capitol Complex
Carson City, NV 89710
Phone: (702) 885-3744

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- APPENDIX D NNWSI Project: Summary of Ongoing and Planned Site Characterization Activities for the Candidate Site at Yucca Mountain, Nevada: May 1986 - April 1987
- APPENDIX E Environmental Requirements Imposed Upon Site Characterization and Repository Development by the Nuclear Waste Policy Act of 1982 and Associated Descriptions of the Environmental Requirements That Apply to Site Characterization and Repository Construction at the Yucca Mountain Site
- APPENDIX F Letter of May 13, 1987 from D.L. Vieth (DOE) to R.R. Loux (NWPO) Responding to State of Nevada Comments on the EMMP for NNWSI

SUMMARY

The Nuclear Waste Policy Act of 1982 (NWPA) directs the U.S. Department of Energy (DOE) to select a suitable site for and to construct, operate, close, and decommission the nation's first geologic repository for high-level nuclear waste. On May 28, 1986 the President approved DOE's selection of three sites as candidates for the repository; Yucca Mountain, Nevada, Deaf Smith County, Texas, and Hanford, Washington. Nevada contends such approvals were legally inadequate (see Nevada v. Herrington, No. 86-7307 and consolidated cases, 9th Circuit Court of Appeals). Under terms of the NWPA the DOE is to conduct site characterization activities at each of these sites to determine site suitability for repository development.

Environmental protection during the course of siting and constructing a repository is mandated by NWPA in conjunction with various phases of repository siting and development. However, DOE has issued no comprehensive, integrated plan for environmental protection. Consequently, it is unclear how DOE will accomplish environmental assessment, monitoring, impact mitigation, and site reclamation. DOE should, therefore, defer further implementation of its current characterization program until a comprehensive environmental protection plan is available.

To fulfill its oversight responsibilities the State of Nevada has proposed a comprehensive environmental program for the Yucca Mountain site that includes the following elements:

1. immediately undertaking studies to establish a 12-month baseline of environmental information at the site;
2. adopting the DOE Site Characterization Plan (SCP) and the engineering design plans it will contain as the basis for defining the impact potential of site characterization activities;
3. using the environmental baseline and the SCP to evaluate the efficacy of the preliminary impact analyses reported by DOE in the EA;
4. using the SCP as the basis for discussions with federal, State, and local regulatory authorities to decide which environmental requirements apply and how they can be complied with;
5. using the SCP, the EA impact review, and the compliance requirements to determine the scope of reclamation measures needed;
6. developing environmental monitoring and impact mitigation

plans based on the EA impact review, compliance requirements, and anticipated reclamation needs; and

7. incorporating environmental studies during site characterization or adjusting the monitoring program to accommodate information needs for the EIS and the siting guidelines once more is known about the repository design.

On the other hand, the approach being taken by DOE to comply technically with individual environmental requirements appears to constitute piecemeal planning. Indicative of this are the steps taken or planned by DOE thus far at the Yucca Mountain Site, including:

1. issuing an environmental assessment (EA) for site characterization and repository development based largely upon historical, non-site specific information and preliminary, incomplete engineering design plans;
2. drafting an environmental monitoring and mitigation plan (EMMP) based on the limited aspects of the environment at Yucca Mountain where the EA predicted significant adverse impacts might occur;
3. planning for an Environmental Regulatory Compliance Program (ERCP) that would identify which environmental statutes and regulations DOE believe apply to the project and that would discuss measures believed adequate for compliance;
4. preparing an (SCP) that describes geologic and hydrologic characterization activities and testing to be performed to determine site suitability; and
5. planning for the environmental studies needed to evaluate site suitability in accordance with siting guidelines (10 CFR 960) and to establish a post-site characterization environmental data base that describes the nature of the Yucca Mountain Site prior to initiation of repository construction (for the environmental impact statement (EIS) needed for repository licensing).

DOE's failure to present the State of Nevada with a comprehensive, integrated plan for protecting the environment gives rise to concerns that the DOE program is insufficient. Because the State of Nevada is responsible for protecting the interests of its citizens an alternative program, described in this report, has been proposed. Nevada's concerns with DOE's program can be summarized as follows:

1. Comprehensive site specific studies at Yucca Mountain were not performed for the environmental assessment, and that document cannot therefore serve in planning DOE environmental

monitoring, mitigation, and compliance activities during site characterization and in resolving key environmental issues.

2. DOE contends that the environmental baseline for the repository EIS begins only after site characterization is completed. DOE also contends that environmental studies are not needed for the SCP even though NWPA Section 113(a) refers to the site characterization plan alternatively as an environmental assessment.
3. The EMMP proposed by DOE does not include monitoring activities that will be required to comply with environmental regulations. The draft plan also does not include reclamation measures for site characterization thus giving rise to concern that reclamation may be deferred until repository decommissioning or overlooked entirely.
4. Components of the DOE environmental program are being planned in a manner that precludes coordinated and integrated review by the State. A comprehensive overview of the program has not been prepared by DOE and as a consequence the program risks being redundant or suffering omissions.
5. An environmental audit program was implemented recently by the DOE Assistant Secretary for Environment, Health, and Safety (EH&S) as a means of identifying environmental requirements that apply to major programs. The procedure involves establishing an environmental baseline, planning in a comprehensive manner for meeting regulatory requirements, coordinating compliance actions, and assuring that environmental requirements are met in a satisfactory manner. DOE has failed to include the repository siting project in the EH&S program and has not provided substantive assurances to the State of Nevada that effective environmental surveys and auditing procedures will be carried out at the Yucca Mountain site.

In conclusion, it is the State's position that DOE site characterization activities should be delayed until a comprehensive, integrated environmental protection program can be incorporated into the SCP. The program should include establishing a site specific pre-site characterization environmental survey, a reassessment of potential impacts, monitoring, mitigation and reclamation, and a sound environmental auditing procedure. Concurrent with DOE planning and implementation of such an environmental program, the State will conduct an independent environmental oversight program for the repository siting project at Yucca Mountain.

1.0 INTRODUCTION

Passage of the Nuclear Waste Policy Act of 1982 (NWPAA) committed the nation to disposing of high-level nuclear wastes in geologic repositories. The legislation recognizes that disposal of radioactive waste is controversial and that a workable solution must be equitable, scientifically credible, and balance various interests (Loux, 1987). Accordingly, the Act establishes a procedure for repository siting that includes a decision-making and oversight role for states containing a candidate repository site. This step was taken by Congress to promote public confidence in the federal government's nuclear waste program (42 U.S.C. 10131(a)(6)). Affected states thus are guardians of the public interest with respect to the high-level radioactive waste disposal program (Strolin, 1987). An important aspect of this responsibility is assuring that environmental quality is adequately protected in the course of the repository project. To achieve this objective for the State of Nevada, an environmental program was initiated by the Nuclear Waste Project Office (NWPO). The goals of the program are:

1. to develop an understanding of the environmental requirements that apply to the high-level nuclear waste project for the proposed site at Yucca Mountain;
2. to review and comment on environmental aspects of the work of the U.S. Department of Energy (DOE) repository project; and
3. to foster the State's environmental policies regarding disposal of high-level nuclear wastes in Nevada.

This paper describes the NWPO comprehensive environmental program in relation to the requirements imposed upon repository siting by NWPAA, NEPA, and other applicable laws. This paper also critiques DOE's proposed environmental program under the same standard.

2.0 BACKGROUND

Disposal of nuclear wastes in Nevada has been under consideration by DOE since mid-1970. Field studies to locate a suitable site for a high-level waste repository were initiated by the agency in 1980 at Yucca Mountain adjacent to the western boundary of the DOE Nevada Test Site. The studies were managed by the Nevada Nuclear Waste Storage Investigations Project (NNWSI) within the DOE Nevada Operations Office at Las Vegas. With passage of NWPA in early 1983, NNWSI was incorporated into the DOE Office of Civilian Radioactive Waste Management (OCRWM) that was created by the Act to manage the repository program.

Procedures specified by NWPA for selecting a repository location require that DOE identify potential sites and that three of those be selected for site characterization on the basis of a preliminary evaluation of siting guidelines. NWPA also specifies that available information is to be used for the evaluation. Once the three sites have been characterized one is to be recommended to the NRC for construction authorization as the nation's first high-level radioactive waste repository.

Repository siting as set forth by NWPA was initiated in February 1983 when DOE identified nine potential repository sites, including Yucca Mountain. Environmental Assessments (EAs) subsequently were prepared and used by DOE to recommend that sites at Yucca Mountain, Deaf Smith County (Texas), and Hanford (Washington) be characterized (DOE, 1986a). The draft EA for the Yucca Mountain site (DOE, 1984a) was reviewed by the State of Nevada (State of Nevada, 1985), revised by DOE, and issued as a final EA on May 28, 1986 (DOE, 1986b) when the sites were approved for characterization. Nevada contends that this process was not conducted in accordance with the Act and that the EA is inadequate (see Nevada v. Herrington, No. 86-7309, 9th Circuit Court of Appeals).

The next step to be taken by DOE in implementing the NWPA repository siting strategy is to conduct site characterization activities at the three candidate sites in accordance with NWPA and the DOE Mission Plan for the project (DOE, 1985a). Site characterization plans are currently being prepared by DOE for carrying out this activity. A consultative draft SCP for NNWSI is expected to be issued by DOE in January 1988.

Among the issues yet to be resolved between DOE and the State of Nevada is how to reasonably assure that the environment at Yucca Mountain will be adequately protected during site characterization. The State provided recommendations in this respect (Appendix A) that DOE did not accept and consequently NWPO has proposed its own environmental program as a means of fulfilling its oversight responsibility for the DOE repository project.

The NWPO comprehensive environmental program described herein addresses non-radiological issues relative to the area to be affected by site characterization and repository development at Yucca Mountain. Also, discussed in this report are the environmental requirements that apply to the repository project, and a critique of the approach being taken by DOE. Socioeconomics, transportation, and radiation safety are covered by other programs.

3.0 THE NWPO ENVIRONMENTAL PROGRAM PLAN

Participation by an affected party in monitoring, testing, or evaluation with respect to site characterization programs is authorized by NWPA Section 116(c) for purposes of reviewing environmental impacts and providing information to residents of the State. On April 7, 1987 the State of Nevada (1987) notified DOE that because DOE remains unresponsive to prior recommendations that NNWSI revise its environmental program to reflect comprehensive, integrated planning the State considers it necessary to initiate its own environmental program. This course of action is necessary because NWPO is not satisfied that the environmental program proposed by DOE either begins with an adequate assessment of the site conditions prior to alteration (the environmental baseline) nor is sufficiently comprehensive. Instead, the NWPO must base its review of the DOE project on objective, site specific environmental data and complete plans for site characterization. Only in this manner can the State report in a responsible fashion to the citizens of Nevada on the status of environmental protection at Yucca Mountain.

The environmental program developed by NWPO is consistent with the views of the State on the EA (State of Nevada, 1985) and on the EMMP (Appendix A). The comprehensive environmental program proposed by the Nevada Nuclear Waste Project Office is designed to provide information needed to objectively decide whether the environment at Yucca Mountain will be adequately protected during site characterization and to provide adequate information upon which to base the environmental impact statement ultimately required by 42 U.S.C. 10134(f). The program will:

1. establish a comprehensive, site specific baseline of information that reflects environmental conditions at Yucca Mountain prior to site characterization;
2. review and evaluate the DOE preliminary analysis of significant adverse impacts reported in the EA and subsequently used for the EMMP;
3. make results and recommendations available to DOE; and
4. proceed with an independent environmental program by extending and converting the baseline field activities into impact monitoring, mitigation, and site reclamation efforts as appropriate and necessary.

This course of action and the rationale for it are discussed below. Details on the NWPO plan have been submitted to DOE (State of Nevada, 1987).

3.1 Establishing the Environmental Baseline

The initial phase of the baseline activity will be a review of existing information to enable designing an efficient field study that effectively provides missing data without duplicating available information. As part of this task an evaluation will be made of the locations of past and planned NNWSI site characterization activities to determine whether the boundary of the currently designated 27.5 square mile affected area is adequate or should be extended to encompass previously disturbed areas.

Activities to establish the baseline will involve one year of field work followed by six months for data analysis and preparation of an integrated report. A detailed schedule is given in Section 3.5.

3.1.1 Terrestrial Ecosystems and Biological Resources

Biological surveys of the Yucca Mountain site were conducted during the summers of 1982, 1983, and 1984 (EG&G, 1983, 1984b, 1985). Ecological information on the region and the transitional zone between the Mohave Desert and the Great Basin Desert in which the site occurs also has been reviewed (EG&G, 1981; Bertram and Everett, 1982) and an evaluation of habitat restoration needs was made (EG&G, 1984a). By virtue of these studies and others associated with the International Biological Program in the 1970s and with NTS considerable literature exists on the biology and ecology of the region (EG&G, 1981).

Limited seasonal surveys conducted at the site from 1982 to 1984 characterized the vegetation, small mammals, and distribution of the desert tortoise. Apparently the only sensitive or special status plants addressed by the survey were Sclerocactus polyancistrus and Lathyrus hitchcockianus. More extensive surveys must yet be conducted to cover all four seasons and additional plant species that the U.S. Fish and Wildlife Service and the Northern Nevada Native Plant Society may consider as candidates for protected status and that may occur in the affected area. This would include such species as Coryphantha vivipara, Erigeron ovinus, Machaeranthera grindelioides, Polygala subspinosa, and several species of Astragalus and enstemon among others (Mozingo and Williams, 1980; U.S. Fish and Wildlife Service 1986; Northern Nevada native Plant Society, 1987).

Existing information also must be supplemented by comprehensive annual surveys, preferably on a long-term basis using permanently established study areas at the site so that ecological changes induced by impacts from site characterization can be documented. Biological indices also

should be established for this purpose, and the relationships between precipitation, flowering plants, and populations of desert rodents is promising in this regard (Beatley, 1976).

Remote sensing should be used to map the site and to determine the extent of surface area already disturbed and the extent of future site disturbance. The generalized vegetation maps available for the 27.5 square mile affected area can be supplemented as needed to serve as ground verification for the remote sensing study. Information provided in this manner is the only effective means of establishing a baseline for the amount of land that must be reclaimed and for following the status of reclamation efforts. Additional quantitative information is also needed on vegetative characteristics important to predicting fire hazards and on the fauna associated with vegetative zones at the site. These and other matters were the subject of recommendations made to DOE by its environmental constructor for the Yucca Mountain biotic surveys (EG&G, 1983, 1984b, 1985).

3.1.2 Soil Resources

The biota and ecology of an area are closely related to the nature of endemic soils. Edaphic factors at Yucca Mountain have not been investigated and no information exists on parameters that influence impacts to soil and on the success of reclamation. Estimates of 100 to 2,000 years have been made for desert soils and ecosystems to recover from disturbance (EG&G, 1981). Management techniques to hasten reclamation have been suggested but not studied (EG&G, 1984a). Other than having mixed or montmorillonitic mineralogy, coarse texture, accumulations of carbonates within a few feet of the surface, low organic matter content, and low carbon/nitrogen ratios, the soils in the Yucca Mountain area are little known. Field and laboratory studies necessary for preparing soils maps of the site must be conducted. Availability of soils maps is essential for understanding potential impacts associated with site disturbance and related erosion and for planning site reclamation.

The fact is that NNWSI has never characterized the soils at Yucca Mountain nor used information about soils in the environmental assessment. NWPO's comprehensive environmental program will compensate for this oversight by reviewing information available from the U.S. Soil Conservation Service (SCS) and by preparing complete soils maps for the site while determining the physical, chemical, and biological properties of the dominant soil types at Yucca Mountain. Loss rates and replacements rates for soils also will be predicted using standard methods established by the SCS.

3.1.3 Air Quality and Meteorology

No data on air quality and meteorologic conditions at Yucca Mountain has been compiled. A site specific meteorologic monitoring program was conducted from 1982 to 1984 that utilized two 10-m towers and collected data including temperature, wind speed and direction, relative humidity, precipitation, and barometric pressure. However, data reduction was never completed and now a new program has been initiated with four 10-m towers and one 60-m tower. Both synoptic-scale meteorological influences and specific terrain-induced fluctuations are being measured (DOE, 1985b) but to date no data are available from the program. Thus, the only information available is contained in an overview of atmospheric conditions based upon NTS and the surrounding region (DOE, 1983a) and an analysis of it based upon preliminary design data for a repository at Yucca Mountain (DOE, 1983b).

The DOE meteorologic program (DOE, 1985b) apparently will include measurements of TSP as the only parameter of air quality to be monitored. However, the monitoring will not precede site characterization but will be conducted coincident with surface preparation and construction of roads and facilities, and other site characterization activities. The resulting air quality data therefore will reflect an impacted environment and will not constitute a true, unbiased baseline. Nonetheless it is such a baseline that DOE plans to use for PSD determinations for the repository. Nevada's proposed environmental program would, therefore, establish its own baseline in order to obtain an accurate measure of air quality degradation.

Requirements that might be imposed by regulatory agencies have not been determined but could include other criteria pollutants. In anticipation of this necessity NWPO plans to monitor SO₂, NO₂, CO, Pb, ozone, and PM₁₀ in addition to TSP. Inasmuch as possible, the DOE monitoring program will be drawn upon to establish baseline information but it may not conform to monitoring specifications of the State of Nevada. This will be established when DOE shares its current information with the State and discusses pollutant emissions inventories expected to result from site characterization activities. Such consultations must occur before the State approves registrations and grants any permits required of DOE.

3.1.4 Hydrology and Water Quality

The U.S. Geologic Survey (USGS) has an extensive hydrologic study program underway at Yucca Mountain and to the extent available at the time, results were reflected in the EA. Also available for the EA was a DOE overview of water resources for NTS and the surrounding region (DOE, 1981). This information will be reviewed by NWPO for applicability to the environmental baseline and it is unlikely that a substantial amount of additional investigation will be necessary.

The USGS hydrographic study focuses on surface water hydrology including flood parameters, quantity and quality of existing surface water runoff, and ground-water discharge. Hydrogeologic investigations address aquifer characteristics, ground-water recharge, and hydrochemistry of both the unsaturated and the saturated zones. The extent to which the USGS studies encompass health related aspects of water quality will be determined. The NWPO environmental program will supplement USGS' study in this area if needed. Once DOE clarifies the water use characteristics and pollution potential associated with site characterization activities, the concerns of regulatory agencies that might influence the baseline information required on water resources will also be determined.

3.1.5 Archeological and Cultural Resources

Cultural resources literature pertinent to NNWSI has been reviewed (DOE, 1983c) and an archeological reconnaissance has been performed at Yucca Mountain (Desert Research Institute, 1982). Limited test excavations have been conducted at 29 of the 178 prehistoric sites discovered to evaluate their significance and to establish the extent of data recovery needed for the area. Apparently determinations of eligibility for listing in the National Register of Historic Places have not been made for any of the sites. The State of Nevada has asked that DOE direct its contractors to recover artifacts and make National Register determinations for all 178 sites as a means of protecting the resources from vandalism during site characterization. This activity will be reflected in the NWPO program and it is anticipated that the DOE archeological contractor, in coordination with NWPO, will resume work to complete the task.

The cultural resource baseline also must include Native American consultations. NWPO will draw upon its ongoing socioeconomic program (Strolin, 1987) to obtain information from reviews of ethnohistoric literature, field surveys, and interviews with Indian people in order to establish the necessary baseline. These activities currently are underway and will involve little additional effort to reflect results in the environmental baseline.

3.1.6 Visual and Acoustical Characteristics

Baseline surveys for noise and aesthetics have not yet been conducted at Yucca Mountain and no site specific information is available. The NWPO environmental program will encompass standard sound level and viewshed analyses typically used for establishing baseline information for subsequent impact assessments. The extent to which induced noise may be important at Yucca Mountain has not been established and will be determined when more complete information is available on site characterization activities, such as site preparation and blasting, that may alter ambient environmental noise levels. This information will be used to design the baseline studies to assure that adequate background data exist for assessment purposes. Unless the preliminary plans for site characterization are significantly altered there is no reason to conduct elaborate viewshed analyses of the site. Characterizing visual qualities of the site as perceived from public access points will be adequate and can be accommodated with minimum effort. Revisions to activities planned can be reviewed to determine if alterations to the project subsequently may impact aesthetics.

3.1.7 Analysis and Integration

Too often an environmental assessment or evaluation is performed on individual components of the environment with little recognition of the complexity of interactions that exist in natural systems. Frequently such a simplistic view of the environment results in critical interactions and sensitive components susceptible to impact being overlooked. The study design developed by NWPO and its contractors for the baseline survey will reflect this concern and the environmental report produced at the conclusion of the effort will in particular acknowledge critical and sensitive aspects of the Yucca Mountain environment.

The success with which it is possible to construct a pre-site characterization data base depends in part upon the extent and timeliness of plans for site characterization to be made available by DOE. Thus, if the SCP is sufficiently descriptive and complete and available early enough in the NWPO program, its implications can be reflected in the environmental baseline program, as discussed in the next section. It is Nevada's intent to provide as accurate a measure possible of baseline environmental conditions at Yucca Mountain before further degradation of environmental quality results from the DOE repository siting program.

3.2 Analysis of the SCP and Proposed Activities for Site Characterization

Potential significant adverse environmental impacts can be reliably identified only if a complete description of the proposed action exists. For site characterization at Yucca Mountain this means knowing the kinds of activities to be undertaken, their location, what is involved that might affect the environment, and the schedule by which the activities will be conducted. Included in the information on proposed activities must be descriptions (source terms) of the quality and amount of atmospheric emissions and aqueous effluents anticipated. Additionally, source terms for any hazardous wastes generated and descriptions of waste management procedures must be available.

Table 1 outlines the information that NWPO expects to receive from DOE on the nature of site characterization activities to be conducted at Yucca Mountain. If the SCP is complete when DOE issues it the information needed for the NWPO environmental program can be obtained by analyzing the plans. Any aspects of the anticipated activities that are not addressed in the SCP will be sought by routine inquiry.

3.3 Review of Preliminary Assessments of Environmental Impacts

Once a comprehensive environmental baseline and complete descriptions of site characterization activities are available NWPO will review the EA and the EMMP issued by DOE for the Yucca Mountain site. Particular attention will be paid to components of the environment that are most likely to be affected by the kinds of perturbations expected to result from site characterization. Based upon what is known about desert environments and the preliminary descriptions of activities that will occur at Yucca Mountain, the potential adverse impacts likely to result are categorized in Table 2.

From the information in Tables 1 and 2 it is readily apparent that the biota at Yucca Mountain must be evaluated from the perspective of extent and location of site disturbance that will occur during site characterization. Additionally, characteristics of the soils must be determined to facilitate evaluations of erosion potential and means of site reclamation. Ambient air quality must be established as a baseline for assessing potential for degradation and inventories must be available for emissions capable of inducing degradation. Similarly, effluents and materials that might reach aquifers or be released to surface drainage must be characterized and the existing water quality and hydrology of the site must be established. Only when these and other environmental parameters such as acoustics, visual perceptions, and cultural resources associated with the site are known, can a credible and effective program be planned for protecting the environment.

Table 1.

**OUTLINE OF INFORMATION NEEDED ON SITE
CHARACTERIZATION ACTIVITIES TO BE UNDERTAKEN AT
YUCCA MOUNTAIN**

1. Locations, type and extent of all ground surface disturbances:
 - a. Access roads;
 - b. Drilling sites;
 - c. Trenches;
 - d. Shot holes;
 - e. Regolith removal;
 - f. Infiltration areas;
 - g. Exploratory shaft surface facilities;
 - h. Explosives bunkers;
 - i. Mine waste water pond;
 - j. Rock storage pile;
 - k. Utility facilities and lines (water, sewer, electrical);
 - l. Sewage seepage field;
 - m. Borrow areas;
 - n. Diversion channels; and,
 - o. Fixed monitoring stations and gauges.

2. Types and volumes of regulated wastes produced and hazardous materials used:
 - a. Solid waste (municipal);
 - b. Drilling fluids and cuttings;
 - c. Sewage (municipal);
 - d. Low-level radioisotopes;
 - e. Hydrofracturing muds;

Table 1. (cont'd)

- f. Mined rock debris; and,
 - g. Spent engine fluids.
3. Types, volumes, and details of use for all regulated materials to be utilized in studies, shaft construction, and testing:
- a. Drilling and hydrofracturing fluids and muds;
 - b. Chemical tracers;
 - c. Radioisotopic tracers;
 - d. Radioactive well-logging sources;
 - e. Dust suppression chemicals; and,
 - f. Fuels and lubricants stored.
4. Emissions inventories, characteristics, and schedules for all atmospheric releases.
- a. Dust and other particulates;
 - b. Engine exhausts;
 - c. Shaft ventilation and exhaust;
 - d. Concrete batch plant; and,
 - e. Rock storage pile.
5. Sources of water supply, use rates, and potable water quality.
-

Table 2.

**CATEGORIES OF ENVIRONMENTAL IMPACTS
THAT MAY RESULT FROM REPOSITORY
SITING AND CONSTRUCTION**

1. Biota and Habitat.
 - a. Surface disturbance will destroy habitat and displace biota; protected or sensitive species could be affected.
 - b. Ephemeral water supplies in temporary catchment basins could be affected where surface disturbance occurs.
 - c. Floodplains and corresponding habitats may be altered.
 - d. Increased potential for fires will result from increased human activity.
 - e. Contaminated surface water or leaked toxic substances may affect biota.
 - f. Birds may collide with towers or frames and power transmission lines may alter raptor habitat.
 - g. Increased noise levels may disturb fauna.
2. Air Quality and Noise.
 - a. Fugitive dust may increase where surface disturbance occurs and during construction of the shafts and the repository.
 - b. Ambient levels of TSP, NO_x, SO_x, and CO (all criteria pollutants) may increase due to mobile and stationary sources.
 - c. Environmental noise levels will increase.
3. Water Resources.
 - a. Sediments and contaminants in surface runoff may increase and cause water quality degradation.
 - b. Runoff rates and patterns and infiltrations rates may be altered where surface disturbance occurs.
 - c. Flood potential may increase due to changes in drainage characteristics.
 - d. Potential may exist for accidental discharge from waste water holding ponds.

Table 2. (cont'd)

- e. Water table draw down may occur in aquifers.
 - f. Potential may exist for contamination of freshwater aquifers by toxic materials.
4. Soils.
- a. Erosion by wind and water may be accelerated where surface disturbance occurs and may lead to loss of productivity.
 - b. Soil compactions may result from increased activity.
 - c. Soil structure and productivity may be altered where soil is stockpiled for reclamation purposes.
 - d. Contamination may result from accidental spills of hazardous and toxic materials.
5. Cultural Resources.
- a. Any existing archaeological sites may be disrupted where surface disturbance occurs.
 - b. Vandalism of artifacts will increase.
 - c. Sites of religious significance may be violated.
6. Aesthetics.
- a. Visual aesthetics may be altered by site clearing, erection of structures and potential night glow.
 - b. Acoustical aesthetics may be altered by construction noise.
-

3.4 Determining Measures for Environmental Monitoring, Mitigation and Site Reclamation

After NWPO has reviewed the DOE preliminary analyses of environmental impacts an evaluation can be made of the merits of the monitoring and mitigation measures proposed by DOE in the EMMP. Although DOE includes only changes in the way site characterization activities are conducted among the measures it considers to constitute mitigation, NWPO is under no such constraints and will adopt the CEQ concept of mitigation (40 CFR 1508.20) which includes impact avoidance altogether, impact minimization by limiting the extent of the perturbation, rectifying the impact by reclamation or conservation measures both during and subsequent to the offending activity, and compensation for the impact by replacement or substitution of sacrificed resources. By not adopting the broader view of mitigation DOE is admitting a willingness to incur impacts if an activity cannot be reasonably altered to avoid them and is casting further doubt on the likelihood that reclamation and conservation measures will be undertaken during site characterization.

Because DOE embraces only a narrow concept of both monitoring and mitigation and ignores reclamation altogether, NWPO must anticipate a continued lack of success in influencing the DOE EMMP in these regards. Should this prove to be the case NWPO probably would take steps to extend its field program beyond the baseline phase and into the site characterization program. Emphasis on field activities would shift from environmental characterization to monitoring for impacts that might necessitate active mitigation or conservation measures during the course of geologic site characterization. A monitoring program that, for example, includes remote sensing techniques would serve to identify and catalog areas of the Yucca Mountain site that must be rehabilitated and reclaimed.

The types of monitoring, mitigation, and reclamation activities likely to prove appropriate at Yucca Mountain that are not reflected in the EMMP are listed in Table 3.

3.5 Schedule

Plans for the NWPO environmental program discussed above and presented to DOE (State of Nevada, 1987) will be implemented as early in 1987 as possible (Figure 1), depending on when funding becomes available in accordance with NWPA Section 116(c). A contractor will be obtained for performing the field studies, preparing the environmental baseline report, and assisting with reviewing the EA, the SCP, the EMMP, and any subsequent environmental information and plans provided by DOE.

Table 3.

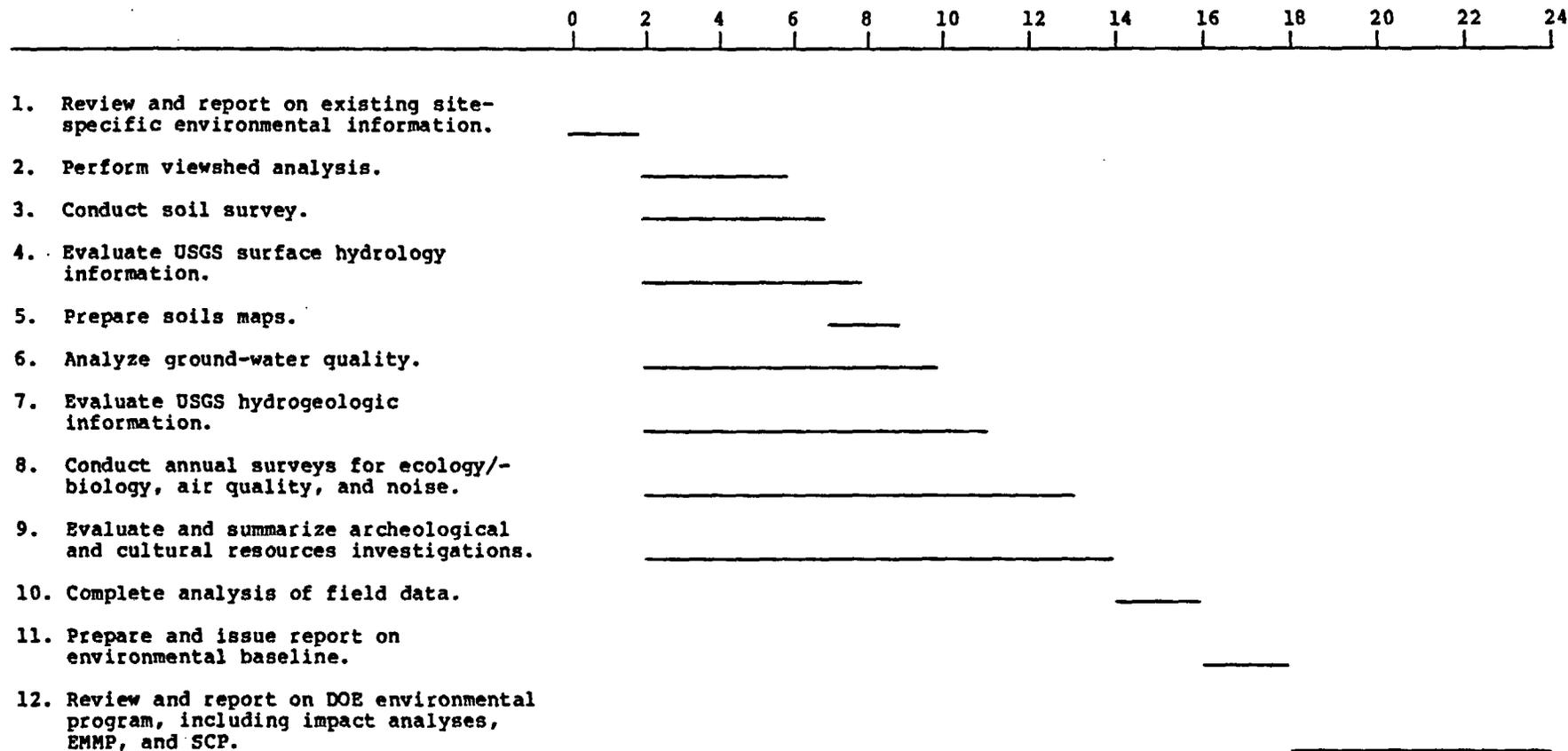
**ENVIRONMENTAL MONITORING, IMPACT
MITIGATION AND RECLAMATION MEASURES POTENTIALLY
APPROPRIATE FOR SITE CHARACTERIZATION**

1. Remote sensing to locate and measure the extent of impacted habitat that must be reclaimed.
2. Development of habitat restoration techniques.
3. Periodic surveys to detect impacts to sensitive or protected species in order to evaluate the need for mitigation;
4. Monitoring of soil losses from erosion, removal, and compaction and studies on soil conservation and restoration.
5. Seepage monitoring for waste effluents and hazardous materials and modification of management procedures if necessary to avoid pollution and adverse impacts.
6. Monitoring of ground-water resources to detect degradation and depletion and to assist planning for conservation and impact mitigation.
7. Reviewing revisions to project design plans for potential impacts to visual aesthetics and recommending alterations for impact reduction or avoidance.
8. Monitoring for increases in environmental noise and recommending appropriate abatement measures.

Figure 1.

SUMMARY SCHEDULE FOR NWPO ENVIRONMENTAL PROGRAM

(Months From Awarding of Contract)



4.0 COMPREHENSIVE ENVIRONMENTAL PROGRAM PLANNING

Programs designed to comply with environmental requirements and to protect the environment must be comprehensive because of the complexity of interrelationships involved in natural environments and the frequently overlapping and redundant nature of regulations. A program that fails to recognize this and take it into account risks both serious omissions and wasteful repetition. Field studies and data analyses should be planned to cover all major components of the environment and to address all needs for common information. These objectives can be met only if all the information required in the course of fulfilling statutory obligations is identified, analyzed, and planned for accordingly. Achieving this goal in the DOE repository project can be accomplished by basing the environmental program on the results of regulatory analysis involving understanding the requirements imposed by NWPA and by related environmental statutes and regulations triggered by actions proposed by DOE. Such an approach to program planning is described in this section.

4.1 Environmental Requirements That Apply To The High-Level Nuclear Waste Repository Project

The NWPA is, among other things, considered to be environmental legislation. It constitutes the central statute governing high-level nuclear waste (Davenport, 1986). The environmental requirements that apply to the DOE repository project are covered in NWPA either by direct mandate or by reference to other laws and in the associated implementing guidelines and regulations. The statutory requirements are listed in Table 4 as they appear in the repository siting procedures set forth by NWPA and are described below.

4.1.1 The Environmental Quality Siting Guideline and Site Suitability Evaluations

Issuance of general guidelines for selecting repository sites is mandated by Section 112(a) of NWPA. The guidelines were issued by DOE in 10 CFR Part 960 on December 6, 1984. The guidelines are subject to legal challenge for failure to comply with the Act (see Environmental Policy Institute v. Herrington, No. 85-7854, 9th Circuit Court of Appeals). Section 5-2-5 of the siting guidelines addresses environmental quality and is included here as Appendix B.

Conditions that qualify or disqualify a site as being suitable for repository development are specified by the guidelines, and for environmental quality the decision is based upon whether or not the environment can be protected and whether or not projected impacts can be mitigated to an acceptable degree. If it can be shown for a site that all federal, state, and local environmental requirements are likely to be met within a reasonable time period, a favorable

Table 4.

**ENVIRONMENTAL REQUIREMENTS AND EXEMPTIONS
RIVED FROM THE NUCLEAR WASTE POLICY ACT
(NWPA) AND ASSOCIATED REGULATIONS**

REFERENCE	ENVIRONMENTAL REQUIREMENT
NWPA Section 112(a).	Requires DOE to issue guidelines for evaluating site suitability for a repository.
10 CFR Part 960, Nuclear Waste Policy Act of 1982; General Guidelines for the Recommendation of Sites for the Nuclear Waste Repositories; Final Siting Guidelines.	Part 960.5-2-5 specifies site suitability conditions for environmental quality.
NWPA Section 112(b)(1)(E).	For each nominated site an environmental assessment is required that evaluates environmental impacts and the siting guidelines (10 CFR 960) and compares site against all other sites considered.
NWPA Section 112(e).	Exempts preliminary siting activities from preparation of an environmental impact statement under the National Environmental Policy Act.
NWPA Section 113(a).	Environmental assessment activity is to be included in site characterization planning and site characterization is to be conducted in a manner that minimizes significant environmental impacts.
NWPA Section 113(b)(1)(A)(iii).	Plans must be prepared for mitigating significant adverse environmental impacts caused by site characterization if a site is determined unsuitable for a repository.

Table 4. (cont'd)

NWPA Section 113(c)(4).

If a site is determined unsuitable for a repository reasonable and necessary steps must be taken to reclaim it and to mitigate significant adverse impacts caused by site characterization.

NWPA Section 113(d).

Exempts site characterization from preparation of an environmental impact statement under the National Environmental Policy Act.

NWPA Section 114(a)(1)(D).

Requires an environmental impact statement in compliance with the National Environmental Policy Act to accompany the recommendation of a site for a repository.

NWPA Section 114(f).

Establishes repository construction as a major federal action requiring compliance with the National Environmental Policy Act; requires repository licensing by the Nuclear Regulatory Commission (NRC) and allows NRC to adopt the DOE environmental impact statement prepared for the repository if practicable.

10 CFR Part 1021,
Department of Energy
Compliance with the
National Environmental
Policy Act.

Adopts regulations of the Council
on Environmental Quality for DOE
compliance with the National
Environmental Policy Act.

40 CFR Part 1500-1508,
Council on Environmental
Quality, Regulations for
Implementing the Procedural
Provisions of the
National Environmental
Policy Act.

Among other things, requires
planning, scoping, and
preparation of an environmental
impact statement concurrent with
compliance with other environmental
review laws; federal permits and
other approvals that must be
obtained for the project are to be
listed.

Table 4. (cont'd)

10 CFR Part 60, Nuclear
Regulatory Commission,
Disposal High-Level
Radioactive Wastes
Geologic Repositories.

Establishes licensing requirements,
including an environmental report
prepared in accordance with 10 CFR
51, and a safety analysis report
that addresses the favorable and
potentially adverse conditions
specified in the siting guidelines.*

10 CFR Part 51, Nuclear
Regulatory Commission,
Environmental Protection
Regulations for Domestic
Licensing and Related
Regulatory Functions.

Specifies contents for environmental
reports, assessments, and impact
statements for licensing including
the need for quantitative and
qualitative impact assessments
and the discussion of environmental
regulatory compliance.*

* These requirements will probably change as the NRC contemplates amendment of 10 CFR 51 in the near future.

condition exists. On the other hand, if it appears that major conflicts with applicable environmental requirements may arise at a site, a potentially adverse condition exists. A favorable versus potentially adverse situation also is specified by the environmental guideline in relation to potentially significant adverse environmental impacts that can or cannot be avoided or mitigated in a reasonable manner. Additional favorable or potentially adverse conditions are specified in terms of protected natural resource areas such as critical habitats for threatened or endangered species, sites that pose unique cultural interests, and designated parks and preserves.

Evaluation of the siting guidelines is required by NWPA in the course of nominating and recommending candidate sites for characterization and for repository site selection. Siting procedures specified by NWPA require an evaluation of the guidelines, based upon available information, to be included in the EA prepared for the sites recommended for characterization. This was accomplished in Chapter 6 of the EAs issued by DOE on May 28, 1986. A final determination of site suitability using the guidelines as criteria is to be made in the course of recommending a site for development of a repository and applying to the Nuclear Regulatory Commission (NRC) for a construction license. Acquisition of the scientific and technical information needed to apply the guidelines for deciding which of the three characterized sites will be approved for repository construction is the purpose of investigations to be conducted coincident with site characterization. The relationship between the determination of site suitability for repository construction and the environmental quality guideline is discussed in Section 4.1.4 which addresses environmental requirements for NRC licensing.

4.1.2 The Environmental Assessment and Partial NEPA Exemption

The NWPA requires that an EA accompany nomination and recommendation of a site for characterization. Statutory elements of the EA are derived from Section 112(b) of the Act and include, among other things, an evaluation of the siting guidelines (including 10 CFR 960.5-2-5), an evaluation of the effects of site characterization on the environment, and an assessment of regional and local impacts of a repository at the site (Davenport, 1986). Relying on Section 112(b)(3) of the NWPA, DOE used only "available information" to evaluate site suitability in the EA. In other words DOE acquired no new site specific environmental information while preparing the EA.

DOE activities for nominating and recommending sites for characterization are exempt from preparing environmental

impact statements as would otherwise be required by NEPA Section 102(2)(C). NWPA Section 112 also exempts preliminary decision-making activities from review under subparagraph (E) or (F) of NEPA Section 102(2). DOE may have interpreted these partial exemptions as excluding all siting activities from NEPA compliance. For example, Mussler (1984) emphasized that the EA is not related to NEPA and must not be confused with environmental review of a proposed action. Burton (1984) further elaborated on this theme by carefully characterizing the NWPA EA as a site nomination decision document. Efforts by the State to determine the DOE environmental review process for pre-site characterization activities have failed to reveal that the agency followed regulations and internal orders governing DOE compliance with NEPA.

4.1.3 Site Characterization Impacts, Site Reclamation, and Partial NEPA Exemption

Section 113 of NWPA permits candidate sites approved under Section 112 of the Act to be characterized. Section 113(a) refers to site characterization plans alternatively as environmental assessments, suggesting that such plans analyze how site characterization activities will be conducted so as to minimize significant adverse impacts. Section 113(b) requires that plans be prepared for mitigating significant adverse environmental impacts caused by site characterization in the event that a site is determined unsuitable for a repository. Implementation of site reclamation and mitigation of significant adverse impacts caused by site characterization is required by NWPA Section 113(c). Criteria for determining site suitability also are to be included in the plan for conducting site characterization activities (NWPA Section 113(b)(1)(A)(iv)).

Conduct of site characterization activities for the purposes of evaluating site suitability does not require preparation of an EIS, according to Section 113(d). Also exempted is review of site characterization under subparagraph (E) or (F) of NEPA Section 102(2). As appears to have been the case for pre-site characterization activities DOE seems to interpret the partial exemptions as excluding all its preliminary decision-making activities from NEPA compliance. To date all attempts to determine how DOE regulations and orders will be implemented for environmental review of proposed site characterization actions have failed. DOE continually implies that site characterization is totally exempt from NEPA, including regulations governing agency planning (40 CFR Part 1501), agency decision making (40 CFR Part 1505) and agency compliance (40 CFR Part 1507).

4.1.4 The Repository EIS, NEPA Compliance, and NRC Licensing

Procedures for recommending and approving a repository site and for authorizing construction are contained in Section 114 of NWPA. Site recommendation for repository construction is considered a major federal action and NWPA Sections 114(a)(1)(D) and 114(f) require preparation of a NEPA EIS. DOE regulations for implementing NEPA (10 CFR Part 1021) adopt the CEQ regulations under 40 CFR Parts 1500-1508. The Nuclear Regulatory Commission must independently evaluate whether DOE's EIS is adequate to support that agency's major federal action of granting a construction authorization of a repository. NRC's rules for that evaluation have not been finalized.

The CEQ regulations and the NRC's independent environmental responsibilities are significant because they involve quantitative as well as qualitative environmental assessment and consideration of regulatory compliance with regard to environmental requirements such as permits, licenses, and reviews. The same requirements apply to NRC's own implementation of NEPA compliance under 10 CFR 51 which NWPA Section 114(f) allows NRC to satisfy by adopting the DOE repository EIS. Notably absent at this stage of NRC involvement in repository licensing is regulatory guidance for NRC's evaluation of DOE's EIS. Preparation of environmental reports for the licensing of nuclear power stations is aided by NRC Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Stations" (NUREG-0099, July 1976). The guide provides a detailed description of the environmental information and analyses required of a license applicant that subsequently is used by NRC to prepare an EIS in accord with 10 CFR 51. Whether or not NRC will issue analogous environmental guidance for the DOE repository is unknown and NRC may await judicial evaluation of DOE's EIS before proceeding with its own environmental evaluation.

A license application for repository construction must include a safety analysis report (SAR) that analyzes the favorable and potentially adverse conditions encountered during site characterization (10 CFR 60.21). It is DOE's intent to use the siting guidelines (10 CFR 960) for this analysis. To assist DOE with the site characterization analysis, NRC issued Regulatory Guide 4.17, "Standard Format and Content of Site Characterization Plans for High-Level Waste Geologic Repositories". There are no comprehensive environmental considerations in Regulatory Guide 4.17, although meteorologic and hydrologic information needed for safety analyses are addressed. It is anticipated that NRC also will issue regulatory guidance for the repository SAR although the schedule and scope of such an effort are not yet known.

4.1.5 Mission Plan Issue 3.1

Section 301 of NWPA requires DOE to prepare a mission plan that describes how the repository program will be carried out. An important aspect of the plan is identification of scientific and technical information needed for repository siting decisions. The mission plan subsequently issued by DOE (DOE, 1985a) adopted a strategy for identifying information needs based upon the siting guidelines. This involved deriving key issues from the guidelines and developing subsets of issues and subordinate information needs analogous to the guidelines. The resulting hierarchy constitutes a framework for organizing data and analyses necessary for addressing issues and questions about site suitability that is consistent with 10 CFR 960.

Four key issues are stated in the mission plan. The third addresses environmental protection during repository siting and development. Issue 3.1 (see Appendix C) focuses on environmental quality in a manner analogous to siting guideline 10 CFR 960.5-2-5. Policies adopted by DOE for resolving Issue 3.1 in the context of the repository program are discussed below.

4.1.6 DOE Environmental Planning

The DOE environmental quality siting guideline relies on a subjective determination of the probability for complying with environmental statutes and regulations as the criteria for protecting environmental quality at a potential repository site. By using regulatory standards as parameters of environmental quality DOE has foregone comprehensive environmental characterization and monitoring that routinely is the essence of environmental protection programs for nuclear facilities. While this policy may serve for preliminary decision making it is not a substitute for the environmental review intended by NEPA and its implementing regulations (e.g., 40 CFR 1501 and 40 CFR 1505.1) prior to implementing a proposed action such as site characterization. However, relying on NWPA Sections 112(c) and 113(d) and the lack of NRC regulatory authority over site characterization, DOE believes it can proceed with geologic site characterization before describing existing environmental conditions in a comprehensive manner.

This policy dictates that DOE planning for environmental monitoring, impact mitigation, and site reclamation called for in NWPA Section 113 will rely upon existing information to the same extent as did the EAs. That DOE will in fact take such a course of action has been confirmed (DOE, 1987a; Rusche, 1987). This policy clearly conflicts with the intent, arising out of NWPA Section 113, that site

characterization plans include environmental assessment and planning as a component of site characterization planning.

The consequence of the DOE decision not to the environment before disturbing it is that the standard practice of performing environmental studies and analyses before the nature of a site is altered will not be followed in the course of repository siting. This outcome is contrary to the intent of NWPA Sections 112 and 113 regarding site nomination, recommendation and characterization.

While DOE does not intend to undertake a comprehensive environmental survey prior to site characterization, it has expressed the intent to conduct field studies during site characterization. This would be in keeping with CEQ and NRC regulations that will apply to the repository EIS. It is uncertain, however, that in the course of the final siting decision and NRC authorization of repository construction that the environmental quality siting guideline will ever be quantitatively evaluated. Such uncertainty arises from the nature of NRC Regulatory Guide 4.17 which fails to include consideration of the environment in site characterization. The omission of environmental considerations in Regulatory Guide 4.17 has resulted in DOE refusing to include environmental assessment in the site characterization plans and stating therefore that resolution of Issue 3.1, analogous to 10 CFR 960.5-2-5, does not require site characterization (DOE, 1985a).

Despite the facts that: (a) DOE has concluded that evaluation of the environmental quality siting guideline does not require site characterization; and (b) NRC environmental analysis is in transition, DOE remains faced with the CEQ regulations governing the content of an EIS prepared for NEPA compliance. That environmental information will be needed for preparing the repository EIS required by NWPA Section 114 is acknowledged by DOE. Accordingly, DOE has decided to conduct environmental investigations concurrent with site characterization activities. As a consequence of this policy the DOE repository siting project will have an environmental field program but it will not take into account the status of the environment before it is altered by site characterization and the resulting data will reflect any impacts caused by site characterization activities.

The focus of DOE's proposed environmental site investigations, as reflected by 10 CFR 960.5-2-5, is dominated by information needed for complying with environmental permits and related approvals for the repository. This again reflects the DOE policy of defining environmental quality principally in terms of regulatory compliance. By characterizing the environment after impacts from site characterization have occurred DOE will in effect

cause the regulatory baseline for the repository to be biased by reflecting degraded environmental qualities. As a consequence the extent of pollutants such as dust resulting from repository construction may appear to be much less significant than would be the case if pre-site characterization ambient conditions were used as the regulatory baseline.

By deferring environmental investigations until site characterization begins DOE in effect has failed to resolve Issue 3.1 during repository siting as called for in the mission plan. The mission plan acknowledges the need for baseline environmental data covering air quality, noise, water quantity and quality, ecosystems, soils, and other resources. Prepared without the benefit of such data, the EAs were unable to address and resolve Key Issue 3 as thoroughly as intended by the mission plan during selection of sites for characterization.

4.2 Regulatory Analysis of Activities Proposed for NNWSI

Due to the incomplete nature of the information provided by DOE to the State, any analysis of applicable regulatory requirements must be considered preliminary. Nonetheless, even a preliminary analysis concludes that DOE's proposed environmental program is not comprehensive or integrated.

4.2.1 Description of Site Characterization and Repository Construction Activities.

Information on proposed activities was obtained from the EA, the EMMP, and a DOE document describing ongoing and proposed activities for site characterization (Appendix D). Table 5 lists activities for site characterization and describes features relevant to planning for environmental concerns. Similar information for repository construction is presented in Table 6. It should be noted that the information in Table 5 does not include activities previously undertaken, e.g., drill holes, trenches, seismic surveys, and

Table 5.
**SITE INVESTIGATIONS AND EXPLORATORY SHAFT CONSTRUCTION ACTIVITIES
 TO BE CONDUCTED AT YUCCA MOUNTAIN DURING SITE CHARACTERIZATION**

ACTIVITY	ENVIRONMENTALLY RELEVANT FEATURES
1. Deep Drill Holes.	<ul style="list-style-type: none"> a. <u>Number</u>: 29. b. <u>Depth</u>: Several hundred to several thousand feet. c. <u>Area Disturbed</u>: 2-3 acres at each site. d. <u>Access</u>: Bladed road average 5 miles to each drill site. e. <u>Mud Pit</u>: 0.25 acres each for waste drilling fluids and cuttings; unlined. f. <u>Testing</u>: Radioactive logging; chemical or radioactive tracers; pump tests of 1-2 week duration at 500 gpm discharge rate to dry drainage.
2. Shallow Drill Holes.	<ul style="list-style-type: none"> a. <u>Number</u>: 244. b. <u>Depth</u>: 30 feet. c. <u>Area Disturbed</u>: 0.1 acre at each site. d. <u>Access</u>: No roadway to be prepared.
3. Trenching.	<ul style="list-style-type: none"> a. <u>Number</u>: 20. b. <u>Area Disturbed</u>: 0.25 acre at each site. c. <u>Access</u>: Bladed road of 1-3 miles per site.
4. Pavements (Overburden Removal).	<ul style="list-style-type: none"> a. <u>Number</u>: 15-25. b. <u>Area Disturbed</u>: 0.2 acre each. c. <u>Methods</u>: Blading or hydraulic pressure.

Table 5. (cont'd)

- | | |
|--|--|
| 5. Infiltration Areas. | a. <u>Number</u> : 87. |
| | b. <u>Area Disturbed</u> : 0.1 acre per site. |
| | c. <u>Access</u> : 1-2 miles bladed road to each site. |
| 6. Geophysical Surveys. | a. <u>Number</u> : 50-200 miles. |
| | b. <u>Area Disturbed</u> : 25-100 acres. |
| | c. <u>Methods</u> : Vibroseis and 50-4,000 lb. dynamite charges. |
| 7. Geologic Mapping. | a. <u>Number</u> : Unspecified. |
| | b. <u>Area Disturbed</u> : Unspecified. |
| | c. <u>Methods</u> : Off-road vehicles, shallow drilling, and trenching. |
| 8. Exploratory Shaft Facility (ESF). | a. <u>Area Disturbed</u> : 20 acres. |
| | b. <u>Access</u> : 0.2 miles paved roadway. |
| | c. <u>Methods</u> : Graded and stabilized with gravel fill. |
| 9. Support Facilities (shaft exhaust fans, buildings, trailers, dormitories, concrete latch plant, explosives magazines, borrow area, rock storage area, waste water pond) | a. <u>Area Disturbed</u> : 5-10 acres in addition to ESF area |
| | b. <u>Emissions and Wastes</u> : Dust, shaft exhaust, diesel engines, cement wash water, muck and mined rock, solid and hazardous materials. |
| 10. Utilities. | a. <u>Electric Substation</u> : 9 kv overhead line, 4.16 kv transformer. |
| | b. <u>Water Supply</u> : 6 miles of pipeline and 150,000 gallon storage tank. |
| | c. <u>Sewage</u> : Septic tank and 2-acre leach field for municipal and industrial (hazardous) wastes. |
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Table 6.

**PROPOSED REPOSITORY CONSTRUCTION ACTIVITIES AT THE
YUCCA MOUNTAIN SITE (BASED ON TWO-STAGE DESIGN AND
VERTICAL EMPLACEMENT OF WASTE CANISTERS)**

ACTIVITY	ENVIRONMENTALLY RELEVANT FEATURES
1. Surface Complex (shafts, ramps, waste handling buildings, administration.	<ul style="list-style-type: none"> a. <u>Size</u>: 150 acres. b. <u>Drainage Control</u>: Flood and personnel buildings, and diversion channels; lined shops, concrete batch evaporation pond for runoff plant) collection. c. <u>Waste-Water Effluents</u>: Retained by lined evaporation pond. d. <u>Atmospheric Emissions</u>: Dust, filtered shaft exhausts, diesel engines, concrete plant.
2. Mined Rock Storage Pile.	<ul style="list-style-type: none"> a. <u>Size</u>: 110 acres. b. <u>Drainage Control</u>: Lined and bermed. c. <u>Atmospheric Emissions</u>: Dust.
3. Access.	<ul style="list-style-type: none"> a. <u>Roadway</u>: 16 miles paved double lane with bridge across Forty Mile Wash. b. <u>Railway</u>: 100 miles with bridge across Forty Mile Wash.
4. Utilities.	<ul style="list-style-type: none"> a. <u>Electrical</u>: Substation and transmission lines. b. <u>Water Supply</u>: New wells up to 120,000,000 gallons per year. c. <u>Sewage</u>: Packaged trickling filter treatment system and seepage pits, trenches, or beds.
5. Controlled Area.	<ul style="list-style-type: none"> a. <u>Size</u>: 24,710 acres.

other exploratory investigations but instead addresses only the site characterization activities that NNWSI has yet to initiate and will include in the SCP.

In addition to over 150 existing drill holes, another 273 will be constructed during site characterization 29, of which will be deep holes involving preparation of drilling pads and access roads. For the deep holes, drilling fluids will be used and wastes will be disposed of in mud pits. Logging with radioactive sources will occur and chemical or radioactive tracers will be used to study movement of ground water. Pump tests also will be conducted on the deep wells and up to 500 gallons per minute of water will be discharged to dry drainage for several weeks.

Another 20 geologic trenches will be dug and 107 sites will be prepared for infiltration studies as part of site characterization. An unspecified number of geophysical surveys will be performed and the total length of surveys lines, including those already completed, may total several hundred miles in length.

The Exploratory Shaft Facility site will occupy a 20-acre area on which various buildings, a concrete plant, and a sewage treatment plant will be constructed. An electrical substation and potable water supply systems also will be constructed. Approximately 67,000 cubic yards of cut and fill will be involved in preparing the 20-acre site. Another five acres will be used for the rock storage pile where mine debris from shaft and drift construction will be placed. About 160,000 cubic yards of mined material (muck) will result from ESF construction. A method for disposing of treated sewage apparently has not been decided upon although the EA states that a septic tank and a 2-acre leach field will be used. It also is possible that the wastes will be removed from the site via truck and disposed of at NTS. This disposal method is anticipated to be used for solid and hazardous wastes although mining effluents will be disposed of on the rock storage pile.

Between 700 and 800 acres of land will be disturbed at Yucca Mountain during site characterization from construction of access roads, site preparation, and geologic studies. DOE has said that soils will be removed from these areas and stored for later use in reclamation.

If a repository is constructed the total surface area disturbed at the site will increase to about 1,700 acres. The repository surface complex would occupy 150 acres and the rock storage area would cover 110 acres. New wells would be constructed to supply water at the rate of 120 million gallons per year as opposed to using existing wells at NTS

which is to be the case during site characterization. The repository phase will involve construction of numerous support facilities and building for waste handling, shop work, administration, and the like. Few details are currently available on the repository and must await availability of the conceptual design plan later in 1987.

4.2.2 Potentially Applicable Environmental Regulations

From the preliminary understanding of proposed activities it is possible to identify the environmental laws that may apply to NNWSI. Table 7 is a list of possible applicable federal laws and Table 8 is a list of possible applicable state and local laws. The explicit requirements associated with these statutes and regulations are summarized in Appendix E.

Included among the statutes in Table 7 and Appendix E is NWPA and related environmental requirements stemming from NEPA compliance and NRC licensing. These are addressed in detail elsewhere in this report and need not be repeated. It is all the other environmental requirements mandated by law that are of interest at this point. For example, the Federal Land Policy Management Act requires public land to be withdrawn for uses such as repository siting; the Floodplains Executive Order and DOE's implementing regulations (10 CFR Part 1022) requires assessment of activities in floodplains such as occur at Forty Mile Wash on the site; the American Indian Religious Freedom Act requires evaluation of Native American cultural resources for federal projects such as NNWSI; the Clean Air Act and the Clean Water Act require protection of air and water quality; and various Nevada Revised Statutes (NRS) and Nevada Annotated Codes (NAC) regulate drilling operations, water rights, sewage disposal, use of radioactive materials, protect biota, prehistoric sites, and water and air quality.

These laws embody detailed requirements that must be complied with in the course of projects like NNWSI. Precisely which of the federal regulatory requirements apply to DOE activities and how they are to be met must be established in consultations between DOE and the administering regulatory agencies. Nevada is now determining which of the state and local laws it intends to assert. When more definitive design details are available on the activities to be initiated, DOE must either meet with the agencies and agree upon compliance procedures or submit completed applications and required information to the agencies for review and approval. If the agency is faithful to its General Design Criteria Manual (DOE Order 6430.1) by addressing all applicable federal, state and local

regulations and laws during planning and design of site characterization facilities, compliance with environmental requirements should be a routine matter.

In addition to the federal requirements reflected by Table 7 there are others that may apply to repository development because of anticipated construction of new rail and highway access routes to the Yucca Mountain site. These are shown in Table 9 and their applicability will depend upon the nature of the environment to be affected by the routes ultimately selected. Those considerations are too far into the future to pursue at this time. Additionally, the NWPO Transportation Program has been designed to assume state action under several federal statutes, including the Hazardous Materials Transportation Act and the Comprehensive Environmental Response, Compensation, and Liabilities Act, as they relate to environmental aspects of radioactive waste transportation in Nevada.

Table 7.

**FEDERAL ENVIRONMENTAL STATUTES, EXECUTIVE ORDERS, AND
REGULATIONS APPLICABLE TO THE YUCCA MOUNTAIN REPOSITORY PROJECT**

Nuclear Waste Policy Act, 42 USC Section 10101 et seq. (10 CFR Part 960; 40 CFR Part 1500-1508 (NEPA); 10 CFR Parts 51 and 60).

Federal Land Policy and Management Act of 1976, 43 USC Section 1701-1784 (43 CFR Parts 2300 and 2800).

Materials Act of 1947, 30 USC Sections 601-604 (43 CFR Part 3600).

Floodplain Executive Order, E.O. 11988 (10 CFR Part 1022).

Endangered Species Act of 1973, 16 USC Sections 1531-1543 (50 CFR Sections 17.11, 17.12, 17.94, 17.95, and 17.96; 50 CFR Parts 222, 226, 227, 402, 424, 450, 451, 452, and 452; DOE/EP-0058).

National Historic Preservation Act of 1966, as amended, 16 USC Sections 470-470w-6; Archaeological and Historic Preservation Act, 16 USC Sections 469-469c; Archaeological Resources Protection Act of 1979, 16 USC Sections 470aa-470ll; American Antiquities Act, 16 USC Sections 432 and 433 (36 CFR Parts 60, 62, 63, 65, 296, and 800; 43 CFR Parts 3 and 7, 25 CFR Part 261; DOE/EP-0098; E.O. 11503).

American Indian Religious Freedom Act, 42 USC Section 1996 (36 CFR Part 296; 43 CFR Part 7).

Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, 42 USC Sections 4901-4918 (E.O. 12088).

Clean Air Act, as amended, 42 USC Sections 7401-7642 (40 CFR Parts 50, 51, 52, 58, 60, 61, 124; Sections 81.300 and 81.400; DOE/EP-0062 and 0065; E.O. 12088).

Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous and Solid Waste Amendments of 1984, 42 USC Sections 6901-6991 (40 CFR Parts 124, 240-247, 260-264, (266, 270-271 and 280; E.O. 12088; State regulations).

Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 and the Water Quality Control Act of 1987, 33 USC Sections 1251-1376; (33 CFR Parts 209, 320, 323-327, and 330; 40 CFR Parts 110, 116, 117, 121, 122, 123, 124, 125, 129, 133-136, 230, 233, 401, 403; DOE/EP-0060 and 0061; E.O. 12088).

Safe Drinking Water Act, 42 USC Sections 300f-300j-10 (40 CFR Parts 124, 141, 142, 143, 144, 145, 146, 147, and 149; E.O. 12088).

Table 8.

**STATE AND LOCAL ENVIRONMENTAL STATUTES, CODES, AND
ORDINANCES THAT APPLY TO SITE CHARACTERIZATION
AND REPOSITORY CONSTRUCTION AT THE YUCCA MOUNTAIN SITE**

Protection and Propagation of Native Fauna; Miscellaneous Protection Measures, NRS 503.590 to 503.660 (Collector's Permit for Taking Native Fauna Covered by Administrative Procedure).

Protection of Trees and Flora; Unlawful Removal or Destruction of Trees or Flora), NRS 527.050 (Permit Requirement for Removing Native Plants Covered by Administrative Procedure).

Preservation of Prehistoric and Historic Sites, NRS 381.195 to 381.227 (Permit Requirement for Field Studies Covered by Administrative Procedure).

Utility Environmental Protection Act, NRS 704.820 to 704.900 (Permit Requirements Proposed as Amendments to NAC 703.415 et seq.).

Appropriation of Public Waters, NRS 533.325 to 533.435 (Permit Requirements Covered by Administrative Procedure and "Regulations Concerning Preparation of Maps Under Application to Appropriate Water and Proofs of Appropriation", State Engineer, 1977).

Underground Water and Wells, NRS 534.010 et seq. (Regulations for Drilling Water Wells, NAC 534.010 ET SEQ.).

Air Pollution, NRS 445.401 to 445.710 (Permit Requirements, NAC 445.430 to 445.716).

Nevada Water Pollution Control Law, NRS 445.131 to 445.354 (Discharge Permit, NAC 445.140 to NAC 445.170; Treatment Works, NAC 445.170; Diffuse Sources and Permit to Construct or Grade, NAC 445.199 to 445.234; Temporary Underground Injection Control Regulations, NAC 445).

Public Water Systems, NRS 445.361 to 445.399 (Water Quality, NAC 445.244 to 445.262; Water Supply, NAC 445.370 to 445.420).

Collection and Disposal of Solid Waste, NRS 444.440 to 444.630 (Solid Waste Disposal, NAC 444.570 to 444.748).

Disposal of Hazardous Materials, NRS 459.400 to 459.600 (Hazardous Waste Disposal, NAC 444.8500 to 444.9335).

Table 8. (cont'd)

State Control of Radiation, NRS 459.010 to 459.290 (Licensing of Radioactive Material, NAC 459.180 to 459.314; Inspections, NAC 459.788).

Construction and Labor Camps, NRS 444.130 to 444.190 (Rules for Sanitary Conditions, NAC 444.550 to 444.566).

Food Establishments, NRS 446.870 to 446.945 (Food Establishments, NAC 446.010 et seq.).

Uniform Plumbing Code, NRS 444.340 to 444.430 (Uniform Plumbing Code, NAC 444.350).

Uniform Building Code and Fire Code, NRS 244.105, 244.3575, 278.023 and 477.010 to 477.250 (State Fire Marshall Regulations, NAC 477.010 et seq.; Nye County Code Title 15).

Table 9.

**ADDITIONAL FEDERAL ENVIRONMENTAL REQUIREMENTS THAT MAY
APPLY TO CONSTRUCTION OF REPOSITORY ACCESS ROUTES**

Farmland Protection Policy Act, 7 USC Sections 4201-4209 (7 CFR Part 658).

Wetlands Executive Order, E.O. 11990 (10 CFR Part 1022).

Wild Free-Roaming Horses and Burros Act, as amended, 16 USC Sections 1331-1340 (43 CFR Part 4700).

Migratory Bird Treaty Act, as amended, 16 USC Sections 703-711 (50 CFR Section 10.13).

Fish and Wildlife Coordination Act, 16 USC Sections 661-666c (DOE/EP-0059).

Bald and Golden Eagle Protection Act, 16 USC Sections 668-668d (50 CFR Part 22).

National Wildlife Refuge System Administration Act of 1966, 16 USC Sections 668dd-668ee (50 CFR Parts 25, 27, 28, and 29).

Rivers and Harbors Appropriations Act of 1899, 33 USC Sections 401-413 (33 CFR Parts 209, 320, 322, 325, 326, 329, and 330);
General Bridge Act of 1946, 33 USC Sections 525 et seq. (33 CFR Parts 114, 115).

4.3 Planning to Meet Environmental Requirements

In addition to the requirements reflected in Tables 7 and 8 and Appendix E, NNWSI also must meet the environmental requirements mandated by NWPA (Table 4). These include evaluating the siting guidelines, minimizing and mitigating impacts during site characterization, planning for site reclamation, and complying with NEPA and NRC licensing regulations for the repository. To comply with the various requirements OCRWM created the generic environmental program described and critiqued in Section 5. DOE has yet to present the State of Nevada with a composite environmental plan but instead appears to be developing separate components of its program independent of one another. Consequently, the State has not seen an integrated environmental program plan for NNWSI that provides assurances that critical concerns are not being overlooked.

A planning methodology that avoids the shortcomings of a piecemeal approach was proposed by Malone (1987) and can be applied to NNWSI with the results shown in Table 10. This analytical approach provides a systematic means of assuring that all environmental requirements imposed by NWPA, NEPA, and other statutes and regulations are evaluated and it demonstrates where similar needs can be met by common measures. It is apparent from Table 8 that the subjective information in the Yucca Mountain EA ultimately must yield to a comprehensive site specific data base. Therefore, it is in the project's best interest to conduct an environmental survey and establish a site specific baseline early to assure that information is available when it is needed as opposed to awaiting step-wise implementation of individual components of a non-integrated program. Taken in concert with evaluating the SCP activities, such a step would provide a basis for reviewing the preliminary impact analyses performed for the EA. In this manner the findings of the EA could be confirmed or adjusted as necessary to reflect an objective as opposed to a subjective assessment. The outcome of this course of planning would be to lend credence to otherwise suspect program plans for monitoring the environment, mitigating impacts, reclaiming the site, complying with NEPA, and licensing the repository.

The approach to planning proposed by Malone (1987) relies in part upon the concept of environmental auditing as discussed by Canter (1985). Environmental auditing is a methodological examination involving analyses and confirmations of practices and procedures leading to verification of compliance with regulatory requirements. Canter (1985) noted that the process is of growing importance with respect to planning for environmental assessment and regulatory compliance. Environmental auditing recently was adopted for programs under the DOE Assistant Secretary for Environment, Health, and Safety (DOE, 1987d). Two phases are involved in the DOE audit procedure the first of which consists of

Table 10.

**STUDIES AND INFORMATION NEEDED TO MEET ENVIRONMENTAL REQUIREMENTS
FOR NPPSI REPOSITORY SITING AND CONSTRUCTION AT THE YUCCA MOUNTAIN SITE ***

ENVIRONMENTAL CATEGORY	ACTIVITIES REQUIRED FOR PERMITS AND APPROVALS FOR SITE CHARACTERIZATION	REQUIREMENTS FOR MONITORING, MITIGATION AND RECLAMATION FOR SITE CHARACTERIZATION	INFORMATION NEEDS FOR NEPA COMPLIANCE AND NRC LICENSING (SAR, ER-EIS) FOR REPOSITORY CONSTRUCTION
Ecological and Biological Resources	Conduct surveys for protected resources; conduct impact assessments for floodplains	Monitor ecological impacts and protected species	Use baseline for site characterization adjusted with results of monitoring program
Archeological and Cultural Resources	Conduct surveys and investigations; recover artifacts for all sites in affected area	Nothing additional required	Nothing additional required
Meteorology/ Air Quality	Conduct baseline surveys for meteorology and criteria pollutants; abate dust and other exceedances	Monitor emissions and all criteria pollutants and abate exceedances	Use baseline for site characterization PSD determination
Surface-Water Hydrology and Quality	Determine drainage patterns for all areas to be graded; characterize effluents discharged into rock storage pile; assure zero discharge from rock storage pile and all drilling operations	Monitor surface runoff and sediment transport; monitor effluents discharged into rock storage pile	Characterize hydrology of any additional areas to be affected
Ground-Water Hydrology and Quality	Characterize all aquifers and associated infiltration potentials; monitor seepage from ESF and rock storage pile and septic tank drainage field; line all mud pits and dispose of wastes off site; line rock storage pile	Monitor all drilling and shaft activities for seepage and fluid loss; monitor all aquifers for quality and quantity	Use baseline for site characterization adjusted with results of monitoring program
Soils	Characterize and map soils; study reclamation techniques	Stockpile soils and manage for reclamation; monitor reclaimed areas for success	Adjust all baselines to reflect impacts to soils during site characterization
Sound and Aesthetics	Establish baselines for sound and visual aesthetics	Monitor sound levels and viewshed; abate construction and operation noises to level of EPA criteria	Use baseline for site characterization

* All needs for site suitability evaluations will be met by addressing the two columns for site characterization.

a regulatory compliance check to identify the activities at a DOE facility that serve to trigger environmental requirements. The second phase consists of developing and implementing a management hierarchy for assigning responsibilities and assuring that compliance measures are taken and that requirements are filled. The planning strategy discussed here is in essence the first phase of an environmental audit and is consistent with the objectives of the recent DOE policy. Such a procedure should be adopted by OCRWM and NNWSI for the repository project in place of the current program described in the following section.

5.0 THE DOE ENVIRONMENTAL PROGRAM FOR REPOSITORY SITING AND DEVELOPMENT

The environmental program for the DOE high-level nuclear waste repository project consists of a series of documents and plans (Table 11) that reflect a piecemeal approach to responding to the requirements stemming from NWSA (discussed above in Section 4). With the exception of the EA and repository monitoring plans, the items listed in Table 11 are components of the environmental program that OCRWM plans to conduct during site characterization. Items available to NWPO to mid-1987 were the EA for Yucca Mountain (DOE, 1986b), a draft of the NNWSI environmental monitoring and mitigation plan (EMMP) (DOE, 1987b), and that presents an overview of the generic environmental program proposed by OCRWM (DOE, 1987c).

5.1 The OCRWM Generic Program Plan

The OCRWM environmental program plan (DOE, 1987c) provides a framework for the three candidate repository sites to follow in the course of complying with NWSA, NEPA, and other applicable statutes and regulations. Figure 2 depicts OCRWM's view of how the program will proceed, but it is obvious that the components are not integrated. Instead, the connections are linear, unidirectional, and there is no indication of interaction or feedback. The program outlined in Table 11 fosters step-wise planning, virtually assuring that DOE's environmental program will lack coordination and comprehensiveness.

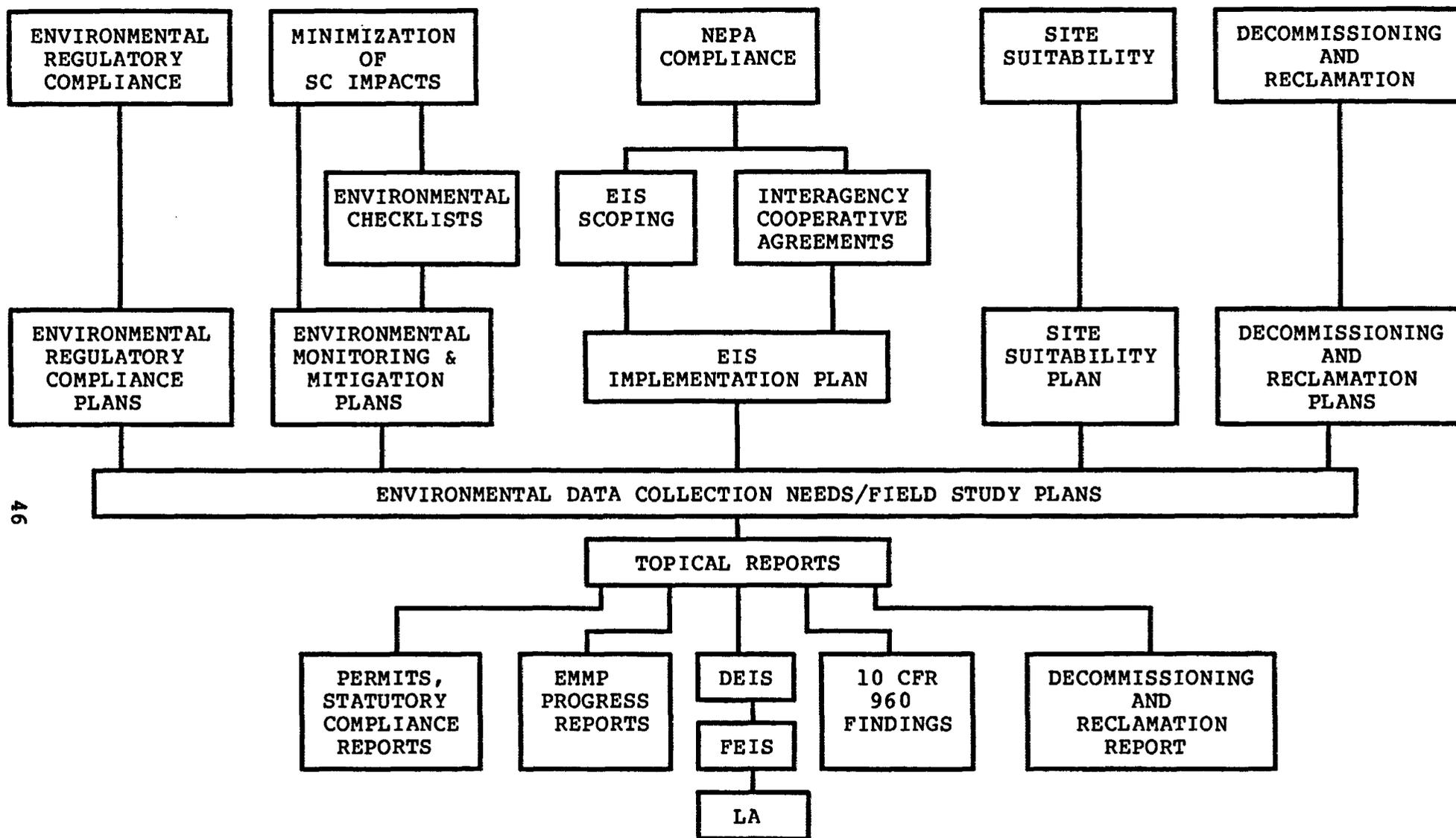
By relying on the largely historical and regional information base in the EAs for site characterization planning, DOE has further handicapped the environmental program. The reasoning behind adopting the EA as the informational basis for environmental planning prior to the EIS is unclear but may have to do with scheduling and perceived time delays associated with establishing a comprehensive site specific environmental baseline prior to site disturbance. A more likely reason is that DOE believes that the act of gathering additional information on existing environmental conditions would imply that the EA information base is incomplete and possibly was inadequate for recommending sites for characterization. Rather than acknowledging now that the EAs were intended initially only as site nomination decision documents (Mussler, 1984; Burton, 1984) DOE is currently using the EAs as though they were originally meant to serve for environmental review.

The EAs are inadequate for environmental review of site characterization activities because they are based on preliminary and incomplete descriptions of the proposed action and were not prepared by appropriate environmental standards. Despite this, DOE is proceeding with its environmental program for site characterization as though environmental review, in accord with

Table 11.

**COMPONENTS OF THE U.S. DEPARTMENT OF ENERGY
ENVIRONMENTAL PROGRAM FOR SITING AND DEVELOPING
HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES**

COMPONENT	PURPOSE
Environmental Assessments.	Issued May 28, 1986 to comply with Nuclear Waste Policy Act (NWPA) Section 112(a).
Environmental Monitoring.	Responsive to NWPA Section 113(a) and Mitigation Plans by providing for monitoring of adverse impacts during site characterization and recommending how to minimize them.
Environmental Regulatory Compliance Plans.	Will evaluate permits and other environmental approvals required for site characterization.
Environmental Site Suitability Plans.	Will develop criteria for the environmental quality siting guideline, 10 CFR 960.5-2-5, to be used for determining site suitability for a repository.
Environmental and Decommissioning and Reclamation Plans.	Required by NWPA Section 113(b)(1)(A)(iii) regarding how disturbed areas will be reclaimed if a site is not selected for a repository.
Environmental Field Study Plans.	Will describe environmental field studies to be conducted during site characterization to provide a baseline for the repository environmental impact statement.
Repository Environmental Monitoring Plans.	Will provide for monitoring during repository operation and afterwards.



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Figure 2. OCRWM Environmental Program Flow Diagram Through License Application (from DOE, 1987c).

NEPA implementation regulations, has either been completed or does not apply. As noted in Section 4.1.3 of this report, site characterization is partially exempt from NEPA compliance but the exemption does not include regulations governing project planning (40 CFR 1501) and decision making (40 CFR 1505.1) with respect to repository siting.

OCRWM expects the project offices to initiate their environmental programs with the preparation of EMMPs. Under OCRWM direction the EMMPs are to address monitoring and mitigation only for those aspects of the environment for which the EAs predicted impacts. In this fashion DOE believes that it will comply with NHPA Section 113(a) by demonstrating minimization of significant adverse impacts. The success of this approach depends upon DOE having accurately forecasted potential impacts and subsequently being able to plan reliable monitoring systems and effective mitigation measures based on a lack of comprehensive site specific data and incomplete descriptions of proposed site characterization activities. Such an approach to environmental management and protection is not consistent with standard professional practice and would not suffice for NEPA compliance.

The second step in the generic program is for the project offices to prepare environmental regulatory compliance plans ERCPs that identify statutes and regulations that apply to site characterization activities. Again the EAs are to serve as the base of information for planning, using largely regional environmental information and preliminary descriptions of proposed activities. The ERCPs are not likely to be reliable or useful because the DOE schedule calls for their issuance prior to completion of the site characterization plans (SCPs) that will provide detailed descriptions of planned activities. Compliance analyses conducted without complete environmental information and project descriptions risk being in error and may not be accepted by regulatory authorities. This is recognized in the DOE mission plan (DOE, 1985a) which states that applications for permits and other regulatory approvals are to be made subsequent to issuance of the SCP. Despite this, indications are that DOE may submit the applications before the SCP is available to regulatory agencies. If this in fact occurs it does not bode well for DOE as a gesture of good faith and confirms that the mission plan cannot be relied upon to reflect how the DOE projects will proceed with the repository program at the three sites. Instead, DOE should follow its General Design Criteria Manual (DOE Order 6430.1) and integrate regulatory compliance with project design.

Subsequent to preparation of the ERCPs, OCRWM expects the projects to develop site suitability plans (SSPs) that can serve for evaluating the environmental quality siting guideline. The generic environmental program plan does not include addressing Key Issue 3 from the mission plan as being among the goals of the SSPs. This may be because it seems inconsistent for DOE to

contend that it needs site specific environmental data to resolve Key Issue 3 during the site characterization phase when in fact the agency found existing data sufficient for addressing the same issue regarding selection of three sites for characterization. There is apparent confusion in DOE between the process of site suitability evaluation under 10 CFR 960.5-2-5 and resolution of Key Issue 3 under the mission plan. It seems that care was taken by DOE to assure that the environmental quality siting guideline was couched in subjectivity while the discussion of Key Issue 3 in the mission plan took an objective approach based upon existence of adequate baseline data. To contend now that resolution of Issue 3.1, for example, requires site specific baseline data for selection of a repository site is in effect an admission that the data base was inadequate for resolution of the same issue in the EAs. Conversely, if existing data were adequate for the EAs, why are they not adequate for the EISs? The answer of course is that existing data will not meet the test of adequacy from the standpoint of environmental review, a test that an EIS for repository development clearly must pass. On the other hand, DOE contends that decision making for selecting sites for characterization (i.e., the EAs) was not subject to the test of environmental review.

The fourth step in the OCRWM program plan is preparation of plans for environmental decommissioning and reclamation to comply with provisions of NWPA Section 113. Reclamation plans will be keyed to the EMMPs and cover only aspects of the environment for which impacts were predicted in the EAs. The plan notes that because of an absence of site specific information it may be necessary to conduct field trials on reclamation techniques. This is one of the few acknowledgements by the generic environmental program plan that the EAs might not contain all the information needed for the site characterization phase.

Late in the environmental program DOE will implement planning for the EIS as required by CEQ regulations. OCRWM acknowledges that the EA data base which sufficed for meeting the subjective standards set by the siting guidelines will not be adequate for NEPA compliance. Scoping and planning for the EIS, therefore, is anticipated by DOE to result in the identification of data needs that can be accommodated only by site specific field studies. Thus, environmental study plans reflecting EIS information needs will constitute the final component of the environmental program prior to repository construction. Although the environmental field plans cannot be completed until conceptual designs for the repository are available and EIS scoping is carried out, DOE intends to implement partial plans at an early stage of site characterization. This situation results from DOE including all field activities associated with the EMMPs, the ERCs, and the SSPs, resolution of mission plan Issue 3.1, and investigations of reclamation techniques as part of the site investigations to be conducted concurrent with site characterization. Because the

program components that comprise the investigations will be developed in sequence beginning with the EMMP and proceeding through the EIS implementation plan, the environmental study plans likewise will evolve and be implemented in a sequential manner without benefit of integration and coordination.

While OCRWM has initiated the planning process and preparation of partial study plans with the EMMP, in reality it is more likely that field information needs will arise first from the regulatory compliance process. This is because environmental permits and related approvals required before site characterization activities can be initiated are likely to require site specific as opposed to regional information for analyses of impacts to environmental quality. Because DOE has not embodied environmental and regulatory considerations in the design review process for site characterization it has little awareness of the significance of compliance requirements to environmental program planning. Moreover, DOE appears to assume that the environmental information and analyses in the EAs will suffice for compliance purposes.

After site characterization is completed and a location is selected and authorized for repository construction, DOE expects a repository monitoring program to be established, followed by a postclosure monitoring program after the repository is decommissioned. These activities are too far in the future to be of concern at this juncture of the environmental program and must wait on conceptual design information and the EIS.

5.2 Program Integration

On the basis of the EMMP for NNWSI (DOE, 1987b), the OCRWM generic plan (DOE, 1987c), and presentations made by DOE to affected parties, it is clear that sequential planning of the program components, particularly in NNWSI, is resulting in a piecemeal approach to environmental protection that precludes integration and coordination. Additionally, the policy of adopting the EA as the environmental baseline for site characterization restricts consideration to only those few areas predicted to be impacted, thereby preventing a comprehensive approach to environmental analysis.

In fairness it must be noted that OCRWM generic planning for the environmental field studies in part implies the need for integration (Figure 3). The matrix illustrated in Figure 3 suggests that an analysis of the environmental requirements stemming from NWPA could result in identifying common information needs that might be addressed in a comprehensive manner by a set of integrated field study plans. A similar approach was proposed by Malone (1987) using the Salt Repository Project (SRP) as a model. The approach involved an analysis of environmental requirements expressed in a matrix format similar to that in

Figure 3. The vertical axis of the matrix listed environmental disciplinary areas to be assessed and the horizontal axis consisted of components of the DOE environmental program corresponding to NWPA requirements. Information needs and corollary activities to satisfy the environmental requirements were identified and defined in the cells of the matrix.

The analysis using SRP as a model began with the regulatory compliance requirements that must be met before site characterization can be initiated then proceeded to environmental monitoring, impact mitigation, and site reclamation. Once those program components were analyzed it was found that almost all information needs arising from subsequently analyzed requirements had already been identified. This was particularly true for site suitability, the needs for which were completely covered beforehand. It also was clear that it would be necessary at the onset of the project to establish a comprehensive environmental baseline prior to any significant disturbance of the site or certain regulatory requirements could not be met. This finding is particularly important because DOE has planned not to establish a pre-site characterization baseline at any of the three sites (DOE, 1987a). However, DOE should have comprehensive baseline information for compliance purposes before site characterization can proceed.

An analysis of requirements like that conducted for SRP is analogous to the initial half of an environmental audit, the second half of which consists of establishing management responsibilities for meeting the needs identified. The SRP model therefore constituted the first half of an environmental audit but did not attempt to second guess the DOE management scheme needed to implement the findings. An effective management system must coordinate and integrate activities that address meeting the needs of environmental requirements with other components of the overall project. Large projects such as site characterization will typically have an Environmental Coordinator position for that purpose. The Environmental Coordinator assures that all permits and approvals required for specific activities are obtained, that all monitoring and reporting requirements are met, and that liaison with regulatory personnel is maintained. The DOE project offices should implement an environmental auditing procedure and reflect it in their management systems. If this does not occur early environmental program planning will almost certainly be conducted on a piecemeal basis and will be destined to lack internal integration and external coordination with other elements of the project. This in turn will expose the overall project to compliance violations that risk interfering with scheduled site characterization activities.

Figure 3.

SAMPLE FIELD STUDY PLAN DEVELOPMENT MATRIX
(From DOE, 1987c)

TOPICS	APPLICABLE REGULATIONS, REQUIREMENTS ¹	INFORMATION REQUIREMENTS	FIELD STUDY PLANS	TOPICAL REPORTS
Ecosystems				
Land Use				
Air and Meteorology				
Water Resources				
Soils				
Noise				
Aesthetics				
Archaeology, Historic and Cultural Resources				
Radiological Levels				
Transuranics and Utilities				
Site Specific Issues				

¹ These include EMMP, Permitting and Statutory Requirements, 10 CFR 960, NEPA/EIS, Site Reclamation, Decommissioning, and Restoration

5.3 The NNWSI Site Specific Program

This section describes and critiques the approach being taken by NNWSI for environmental program planning. This critique is somewhat circumscribed as there is little documentation to draw upon other than the EA, the EMMP, and several presentations on the environmental program that were attended by State of Nevada representatives.

A comprehensive peer review of NNWSI (DOE, 1984b) that included the environmental field program reported that individual investigations appeared to have been well conducted but were not integrated and that overall the program failed to address voids in site specific information. The review team suggested that the program resembled "a dissociated collection of basically credible reports surrounded by unknowns as to what comes next and when."

5.3.1 The EA for the Yucca Mountain Site

In preparing the Yucca Mountain EA (DOE, 1986b) NNWSI was fortunate in having available some site specific data, primarily from biological and archeological surveys, and did not have to depend entirely on regional information as the SRP did for the Deaf Smith County site in Texas. However, site specific information on Yucca Mountain was not as extensive as that for the BWIP site on the DOE reservation at Hanford, Washington. Unlike the BWIP site, Yucca Mountain is not located on DOE controlled land and is outside the perimeter of the Nevada Test Site (NTS).

A draft EA (DOE, 1984a) was issued by DOE and reviewed by the State of Nevada (1985). Comments submitted by the State subsequently were responded to by DOE in the final EA, typically with an explanation as to why the comments were not accepted. Chapters 3, 4, 5, and 6 of the EA presented the environmental information available on the Yucca Mountain site and surrounding region and described the preliminary design plans for site characterization and repository development. Environmental impacts and the siting guidelines also were analyzed and evaluated as well as could be expected on the basis of incomplete environmental data and preliminary descriptions of proposed actions. At the time the EA was being produced, the State of Nevada hoped that the impact analyses for site characterization were considered by DOE to be preliminary in nature and, like those for the repository, would be reassessed when activity plans were more complete and after a comprehensive environmental baseline survey had been conducted. There was basis for expecting a more thorough assessment and review of environmental impacts when Sinnock (1984) pointed out that NNWSI initially would conduct preliminary assessments based on qualitative information and professional judgment but that eventually more detailed

quantitative evaluation would be required. Unfortunately, that hope has not been realized and matters have been made worse by the DOE decision to plan for environmental aspects of site characterization using only the EA, despite the fact that comprehensive environmental baselines apparently will be established at the BWIP and salt repository sites prior to site characterization. The State of Nevada now is faced with attempting to understand more fully (a) the limitations posed by the EA serving as the basis for the planning of monitoring, mitigation, and reclamation activities for site characterization and (b) the potential threat that decisions based upon the preliminary analyses pose to the Yucca Mountain environment.

Chapter 3 of the EA describes what is known about the environment of Yucca Mountain and addresses such considerations as ecosystems, hydrologic conditions, air quality and meteorology, noise, aesthetics, and cultural resources. At the time that the EA was prepared the principal information on the site available to DOE resulted from literature reviews and surveys conducted for complying with environmental resource protection statutes and regulations. To this end DOE contractors conducted both biological and archeological surveys where site disturbances were to occur from drilling and other exploratory activities. This encompassed a 27.5 square mile affected area that included some drilling sites and the ESF location.

To the extent performed, the reviews and surveys of protected biological resources (EG&G 1981, 1982, 1983, 1984a and b, and 1985) were well executed and provided information vital to environmental analysis. However, several critical issues were not fully pursued. First, there is no information available on the nature of soils at the site despite the fact that the EA says that soils will be removed, stockpiled, conserved, and subsequently replaced where site preparation occurs. Successful management and reclamation of soils cannot be accomplished without an understanding of soil properties. Reclamation also cannot be successful if techniques for re-establishing vegetation are not developed. These oversights were recognized by the DOE field contractor but recommendations to develop the information needed were not acted upon by DOE.

Another shortcoming of the biological survey was that the area covered failed to include all of the drilling sites in the vicinity of Yucca Mountain. A significant number of disturbed areas were outside the perimeter of the 27.5 square mile study area and the delineated area plus the surveys conducted inside it tended to focus on easily accessible locations rather than on all locations likely to be affected. There also was a tendency to perform the studies on DOE

controlled land inside the NTS boundary when in fact the ESF and many of the drill holes are outside the NTS perimeter.

A third oversight of the biological studies at Yucca Mountain is that the ecosystem was not studied to the extent necessary for characterizing natural variability. Survey lines and plots were established in 1983 (EG&G, 1984b) but were not maintained and sampled over a sufficient period of time. Relative abundance of dominant species was established but studies to determine the sizes and fluctuation in populations were not pursued. Without an adequate baseline for such parameters it will not be possible to understand changes induced by site characterization activities regardless of how much monitoring might be conducted after the project commences. Similarly, information critical to ecological modeling is lacking. This particularly is true for predicting fire hazards, another recommendation made by the DOE field contractor because of the large potential for fires at the site.

In regards to cultural resources at Yucca Mountain an overview has been published (DOE, 1983c) and a DOE contractor conducted an archeological reconnaissance which identified 178 prehistoric sites (Desert Research Institute, 1982). However, steps to recover artifacts and enter eligible sites into the National Register of Historic Places have been taken only of locations that will be directly disturbed by drilling, surface preparation for the ESF, construction of access roads, and other site characterization activities. Archeological sites on non-disturbed areas that are adjacent to project activities are at risk of being vandalized and should also be reclaimed and entered into the National Register of Historic Places, if eligible. There have been no DOE surveys or consultations concerning the potential for Native American religious resources associated with Yucca Mountain and this is a major deficiency regarding baseline information.

At the time the EA was prepared there was no site specific information on air quality and meteorologic conditions at Yucca Mountain. Meteorologic information only was available for NTS (DOE, 1983a), and a preliminary atmospheric assessment was performed for the repository (DOE 1983b) but not for site characterization. On the basis of calculations reported in the EA DOE concluded that air quality would not be affected by site characterization but that total suspended particulates (TSP) could be increased significantly during repository construction. Since the EA was issued DOE has installed meteorologic towers and equipment at Yucca Mountain to monitor parameters of atmospheric dispersion for use in repository licensing (DOE, 1985b). Apparently there are plans, as part of site

characterization, to monitor TSP at the site. However, no pre-construction baseline will be established (DOE, 1987b) and the data collected will reflect not only naturally occurring TSP but also that contributed by site characterization activities. This abnormal baseline depicting impacted conditions will be used by DOE for the repository EIS and may assure that no adverse impacts from the repository will be predicted.

Chapters 3 and 6 of the EA summarize the information available on hydrology and water quality for Yucca Mountain. The U.S. Geological Survey (USGS) currently is conducting extensive investigations on flood potential and hydrogeology but incomplete information was available when the EA was prepared. Data on water quality parameters of interest to environmental and public health concerns are scant for the site and the issue has received little attention in NNWSI.

Environmental characteristics of Yucca Mountain that govern noise and visual aesthetics were given scant consideration in the EA and no quantitative data exists for evaluation of impacts. These aspects of environmental quality seem of little interest to DOE perhaps because of the remote nature of the site. However, the DOE environmental field contractor acknowledged the potential for sound wave vibrations during seismic testing to induce impacts to wildlife (EG&G, 1983) but quantitative studies to dispel or substantiate the concern have not been conducted and the issue was not mentioned in the EA. The possibility of visual impacts from site characterization was alluded to in Chapter 4 of the EA but no attempt was made at evaluation and the issue was dismissed as being inconsequential.

The precision with which the EA predicts impacts is reflected by the adequacy of the descriptions of proposed site characterization activities. In this regard the EA is deficient. For example, there is no map regarding locations of drilling activities and access to them and no information on depths of holes and the composition of drilling fluids used. Routes of seismic lines that have or will result in destruction of vegetation (EG&G, 1983) are not shown although at least 50 miles of lines have been or will be established. Additionally, the EA gives no information on exploratory holes and other investigations previously conducted at the site by NNWSI. The State of Nevada received no such information prior to March 1987 when DOE provided the State with a document describing ongoing site characterization activities containing illegible maps showing existing drillholes at 150 or more locations on the Yucca Mountain site (see Figures 1 and 2, in Appendix D). The DOE biological field contractor reported that these activities resulted in significant habitat loss and destruction of some protected

species (EG&G, 1983). Further, mud pits had been found breached at some drilling sites causing additional destruction of vegetation and pollution of washes. The contractor later reported (EG&G, 1984b) that during 1983 no preconstruction biological surveys were performed at sites of activities and that the habitat at all such locations was destroyed. Discretely, the contractor did not specify the number of locations nor the areal extent of habitat destroyed in violation of environmental protection statutes.

A full description of activities yet to be conducted at Yucca Mountain must await issuance of the SCP later in 1987. However, lack of site specific environmental data and complete descriptions of proposed actions did not prevent DOE from evaluating the environmental quality siting guideline in Chapter 6 of the EA. In many cases the evaluations of favorable, potentially adverse, qualifying, and disqualifying conditions specified by guideline 10 CFR 960.5-2-5 were based on subjective inferences drawn from Chapters 3, 4, and 5. The nature of the guideline, with emphasis on statutory compliance, allows evaluation in the absence of quantitative information and in that respect differs from CEQ and NRC requirements for environmental analysis. It is equally unfortunate that DOE is using the same deficient information as the basis for its EMMP.

A serious shortcoming of the Yucca Mountain EA is that it fails to be comparable with the EAs for the BWIP and SRP sites with regard to environmental information. Thus, NNWSI is bracketed by BWIP which has a considerable amount of site specific data and by SRP which currently has none. This disparity is being compounded by BWIP proceeding now with work to complete a comprehensive site specific environmental baseline after the EA was issued.

5.3.2 The EMMP for Site Characterization

The Yucca Mountain draft EMMP (DOE, 1987b) was based on Chapter 4 of the EA, in keeping with OCRWM policy (DOE, 1987c). The State's comments submitted to DOE on the EMMP are at Appendix A. The EMMP does not include establishing a site specific environmental baseline, nor does it include complete plans for site characterization. Because these other components of the DOE environmental program will not be available until later in 1987 or 1988 and the field study plans will not be completed until after EIS scoping, the EMMP constitutes piecemeal planning that is out of context with the remainder of the program. The State requested that DOE stop work on the draft EMMP until a comprehensive environmental baseline is established and the SCP becomes available. At that time EIS scoping could be conducted and program planning could proceed on an integrated basis. The

State's criticism and recommendations were rejected by DOE. (Appendix F).

The draft EMMP for NNWSI provides more information on the nature of site characterization activities than did the EA but not as much as subsequently was contained in DOE's March 1987 document describing ongoing and planned activities (Appendix D).

The draft EMMP was consistent with the EA regarding anticipated impacts from site characterization. It acknowledged only the potential for adverse effects to ecosystems from site disturbance, to air quality from dust, and to archeological sites from direct disturbance. Biological monitoring during site characterization is planned of the areal extent to which surface disturbance occurs and for only one sensitive species, the desert tortoise. No permanent field plots are to be established and observed. Contrary to CEQ regulations (40 CFR 1508.20), reclamation practices were not considered as mitigation measures in the EMMP because reclamation is a component of standard engineering practice that DOE claims to take for granted. (None of the 100 or so previously disturbed sites at Yucca Mountain have been reclaimed and there appears to be no plan to do so).

The EMMP explains that soils will not be monitored because DOE expects no impacts to result from soil removal and stockpiling (soils were not addressed in the EA and there is no information on their nature at the site). Air quality monitoring during site characterization is planned for TSP near the ongoing activities (thus assuring that the baseline for the EIS reflects impacts from site preparation, hauling of mine rock, and windblown dust from the rock pile during site characterization). Recovery of artifacts from disturbed archeological sites is planned, as required by the National Historical Preservation Act, but sites adjacent to and in the vicinity of activities will not be protected against vandalism. A baseline program for determining background levels of radon and other radioactive materials at Yucca Mountain will be conducted during site characterization thus assuring, as with TSP, that the baseline reflects impacts from ESF construction and other activities.

DOE has not accommodated Nevada's comments on the draft EMMP and is proceeding with the EMMP as it was initially envisioned. If the EMMP envisioned by NNWSI is implemented there will be no means by which to detect impacts caused by site characterization to ecosystem structure and function in the affected area, no means for conserving soils and estimating the extent of losses, no means for determining degradation to air quality, no measures of changes in

environmental noise levels and alterations in visual resources at Yucca Mountain, and no way to prevent vandalism of the numerous archeological sites throughout the area.

More significantly, DOE has not recognized potential degradation to ground-water resources that might result from geologic and hydrologic investigations. The exact number of deep drill holes at the site is unknown because DOE has not applied for permits required, prior to drilling and testing wells. However, the number of wells that have used drilling fluids, radioactive logging, and well injections could be as many as 100 (Appendix D). How many of these have experienced excessive loss of drilling fluids, loss of radioactive sources, breaches of mud pits, and related accidents that could result in pollution of water resources is unknown. For these reasons NNWSI should include monitoring of ground-water quality in its EMMP for Yucca Mountain.

An environmental program with such shortcomings, as reflected in the EMMP, does not provide for adequate environmental protection. The quality of NNWSI's EMMP is far below what has been proposed by BWIP and SRP, both of which have developed environmental programs based on establishing comprehensive pre-site characterization baselines and continuing the corollary field studies through site characterization. Thus, at the Texas and Washington sites there are reasonable assurances that any impacts caused by site characterization will be detected and that environmental baselines both prior to and after site characterization will exist for regulatory compliance, reclamation, and the EIS. Without such assurances at Yucca Mountain the three candidate repository sites will not achieve comparability and the NNWSI program will be deficient by comparison.

5.3.3 The ERCP for NNWSI

Beyond what is contained in the EA, there are few insights to OCRWM planning for environmental regulatory compliance. Over the years statutory requirements and laws governing environmental protection have received mixed attention from DOE which historically has sought immunity from environmental regulations in the interest of national security. Recently federal courts have tended to rule against DOE when states sought to gain DOE compliance with environmental laws. This trend has prompted DOE to reconsider its traditional attitudes and has resulted in a DOE Environmental Policy Statement (DOE Notice 5400.2) committing the agency to comply with all applicable federal, state, and local environmental laws. The policy is fostered by draft DOE Order 5480.12, General Environmental Program Requirements, currently under review for adoption as DOE restructures its internal environmental directives to

implement DOE Notice 5400.2. Additionally, on April 9, 1987 the DOE Assistant Secretary for Environment, Health, and Safety announced that the agency will be implementing environmental audits at its facilities to provide "systematic, documented, periodic and objective reviews of DOE facilities and practices related to meeting environmental requirements . . ." (DOE, 1987d).

The ERCP for NNWSI will not foster acquisition of permits and other approvals if, as is OCRWM policy, the EA serves as the basis for compliance planning. It is clear from both the EA and the EMMP that NNWSI has not described and quantified pollutant source terms associated with site characterization activities, a step that must be taken before credible compliance plans can be developed. Additional measures that must be reflected in the ERCP are: (a) actions to comply with non-exempt portions of NEPA and the CEQ implementing regulations during site characterization; and (b) integration of compliance planning with design review.

Recent presentations by DOE to Washington, Texas, and Nevada reveal that the ERCP's for the three states will not be comparable. For example, both SRPO and BWIP have adopted auditing procedures for conducting compliance reviews and assigning responsibilities for obtaining required permits and approvals. NNWSI has not established an environmental audit procedure for identifying regulatory requirements and designating management authority and responsibility within the project.

The burden for complying with State of Nevada environmental laws rests with the regulated party. To date DOE has not complied with State efforts to enforce water rights requirements at the Yucca Mountain site and has failed to obtain drilling permits. Some DOE environmental field contractors have acquired proper approvals from the State prior to collecting biological samples (EG&G) and conducting archeological investigations (Desert Research Institute). Before NNWSI progresses further it must develop a compliance program based on environmental auditing procedures and DOE management must commit to comply with all environmental requirements as is the intent of the DOE Secretary's Environmental Policy Statement (DOE N 5400.2).

5.3.4 Site Reclamation for NNWSI

Although the OCRWM generic environmental program plan includes a component for site reclamation (DOE, 1987c) there is no indication that NNWSI will follow suit. To the contrary, the EMMP for the Yucca Mountain site excludes reclamation as a viable means of mitigating impacts, and the past practice in NNWSI has been to ignore abandoned sites.

DOE environmental contractors' recommendations that reclamation techniques should be developed have been ignored. Recent presentations by NNWSI have not included reclamation as one of the purposes of field studies.

The OCRWM policy of defining baseline environment as the condition after impacts from site characterization have occurred is professionally wrong. Setting the environmental baseline at that time, prior to initiation of repository construction, sets the worst possible environmental condition as the pre-alteration condition, from which the environmental impact of repository construction would be measured. Failing to monitor all aspects of the environment assures that impacts caused by site characterization will go undetected and subsequently will be reflected in the repository baseline for the EIS. Such policies are contrary to acceptable practice and are not in keeping with NWPA, NEPA, and other environmental requirements.

5.3.5 Site Suitability Plans for NNWSI

As with reclamation, there is no indication that NNWSI will develop plans for evaluating site suitability via the environmental quality siting guideline. This is of comparatively small significance. If plans for compliance, monitoring, mitigation, and reclamation were to be prepared in accord with OCRWM directives, all aspects of site suitability might be addressed by them. But, if NNWSI fails to prepare proper environmental protection plans, as appears to be the case, there is no hope that site suitability plans would accomplish anything greater. This is an issue which OCRWM must confront in the interest of managing comparable projects at the three candidate repository sites. The problem is compounded by the confusion existing between site suitability and resolution of Key Issues in the mission plan as previously discussed in Section 5.1 of this report.

5.3.6 EIS Planning for NNWSI

OCRWM has developed an elaborate scheme for EIS planning that proceeds from scoping through the preparation of an implementation plan and reaching cooperative agreements with other federal agencies to developing management plans. A draft EIS Implementation Plan is being prepared that portends to be comprehensive and detailed. How the plan will be reflected in the NNWSI environmental program will remain unknown for some time as will the standards by which the EIS is to be prepared. Also unclear is the role of the EIS and associated planning in evaluating 10 CFR 960.5-2-5 and in resolving Key Issue 3. Confusion in DOE in this regard results from the dilemma created by inadequacies in the existing data base, its use in the EA for evaluating site

suitability and issue resolution, and the corollary absence of environmental review for site characterization. The DOE policy that existing environmental data for the EA were adequate for these tasks initially is contrary to the current position that additional data are needed for the same tasks for the EIS stage. This inconsistency has yet to be reconciled by the agency and is the source of much of the obfuscation characteristic of the environmental program.

Further concern over adequacy of planning for the EIS arises from the intent of DOE to adopt an environmental baseline that incorporates impacts from site characterization. Such a biased and flawed baseline would not represent the nature of existing conditions at Yucca Mountain but instead would reflect degradation of environmental quality as a result of disturbances caused by site characterization and never mitigated or rectified by reclamation.

The environmental baseline for the NNWSI EIS may include impacts from site characterization. Such a baseline would inherently be biased by reflecting degradation to environmental quality resulting from disturbances caused by site characterization. For example, the air quality baseline for suspended particulate matter to be used for making Prevention of Significant Deterioration (PSD) determinations under the clean air regulations could include dust resulting from site preparation and road construction during site characterization.

5.3.7 Environmental Field Study Plans

Development of field study plans presents NNWSI with an opportunity to adopt a comprehensive and integrated approach to environmental program planning. The need for such an approach was noted previously by an independent peer review team (DOE, 1984b). However, NNWSI is currently preparing field studies to accommodate only the EMMP. At a later date it will add plans for meeting the needs of the ERCP and still later other program elements will be added one at a time without apparent forethought to coordination and integration. This is disconcerting because seemingly there is no means for assuring that information needs and compliance measures taken early in the program will not conflict with subsequent actions not planned for before implementation of field activities. To remedy this situation NNWSI should develop and share with the State of Nevada a comprehensive environmental program plan that both justifies and describes the major field activities contemplated to meet the needs for monitoring, mitigation and reclamation, compliance, site suitability evaluation and issues resolution, and EIS

preparation. Such a plan could be based on the SCP, design plans, and existing insights to potential environmental concerns likely to arise during EIS scoping. Adjustments to the program plan readily could be made to accommodate subsequently arising concerns which in reality are unlikely to deviate significantly from those expressed in the course of EA preparation and review and since the release of the final EA.

Without a comprehensive, integrated plan that places the field studies into perspective with the overall environmental program, the State of Nevada cannot effectively comprehend and evaluate the NNWSI project. An adequate environmental program plan should be part of the SCP and included among the various documents that DOE envisions submitting to the State in January 1988. Reflected among the submittals should be field study plans indicative of analytical efforts on the part of DOE that illustrate an understanding of and willingness to meet the environmental requirements imposed upon NNWSI by NWPA, NEPA, and all other federal and state laws that apply to repository siting. In the absence of such insights to the DOE program the State will not have proper assurances that the repository project will be conducted by DOE in a manner consistent with sound policies of environmental protection.

5.3.8 Repository Monitoring

As noted in Section 4.1, the OCRWM generic environmental program includes planning for monitoring during repository construction and after repository closure. Emphasis almost certainly will be on radiation monitoring but it is too early to expect DOE to be preparing such plans. The intent has been expressed (DOE, 1987c) that the monitoring plan will serve the needs of affected parties and other federal agencies. It is yet to be seen whether that will be the case.

5.4 Contrast with WIPP

DOE's limited and unintegrated environmental program planning is difficult to explain in light of the precedent set with the first DOE geologic repository being constructed at Carlsbad, New Mexico. At the WIPP (Waste Isolation Pilot Plant) site a comprehensive environmental program has existed since 1975. Extensive pre-site disturbance studies were conducted to establish an environmental baseline (Reith and Kehrman, 1985), a complete regulatory compliance plan was prepared (D'Appolonia, 1979) and the environmental baseline is being kept current with a data acquisition program (Reith, 1985). Additionally, there are ongoing ecological and environmental monitoring programs that include an updated compliance analysis (DOE, 1985c, 1986c). These

programs and information that results from them are openly shared with the State of New Mexico.

By contrast with WIPP, NNWSI has been reluctant to open its environmental program and share information with the State of Nevada despite the intent of NWPA to foster such cooperation. The most logical rationale for this stance by DOE is that it wishes to preserve the integrity of the EA and not call into question the validity of the information base by acknowledging that additional data are needed on the Yucca Mountain site for planning environmental programs for site characterization. It is unfortunate that DOE does not abide by its earlier held position that the EAs were site nomination decision documents rather than environmental assessments in the traditional NEPA sense (Mussler, 1984; Burton, 1984). That position would have allowed DOE to separate the EAs from further environmental review in the course of program planning and proceed with obtaining site specific data as intended by NWPA. The inconsistencies resulting from the lack of clarity regarding decision making, issues resolution, and environmental review with respect to the repository siting program in Nevada are disconcerting and likely to obstruct sound environmental program planning.

6.0 CONCLUSION

Nevada has proposed a comprehensive program for environmental protection at the proposed repository site at Yucca Mountain which DOE will soon characterize. DOE's own environmental plan is inadequate because it does not include a survey of existing environmental conditions at the site, is neither comprehensive nor integrated, does not describe reclamation measures that may be needed, and fails to incorporate environmental auditing procedures.

The independent environmental program proposed by the State and described in Section 3 of this report is consistent with the policy recently announced by the DOE Assistant Secretary for Environment, Health, and Safety (DOE, 1987d) for performing environmental audits at major DOE facilities. DOE's plan is not. Consequently, NNWSI site characterization should not proceed until DOE has incorporated a comprehensive, integrated environmental protection plan into the SCP and committed to satisfactorily meeting all the environmental requirements appropriate to the Yucca Mountain site.

REFERENCES

- Beatley, J.C. 1976. Rainfall and fluctuating plant populations in relation to distributions and numbers of desert rodents in Southern Nevada. *Oecologia* 24:21-42.
- Bertram, S.G. and J.J. Everett. 1982. NNWSI environmental characterization prior to the exploratory shaft. In, Proceedings of the 1982 National Waste Terminal Storage Program Information Meeting, pg. 125-128. DOE/NWTS-30, Dec., 1982, U.S. Dept. of Energy.
- Burton, E.S. 1984. Statutory environmental assessments under the Nuclear Waste Policy Act of 1982: Process, content, and status. In, Proceedings of the 1983 Civilian Radioactive Waste Management Information Meeting, pg. 245-247, CONF-831217, Feb. 1984, U.S. Dept. of Energy.
- Canter, L.W. 1985. Impact prediction auditing. *Environ. Professional* 7:255-264.
- D'Appolonia, Inc. 1979. Federal and State Permits and Approvals for the Waste Isolation Pilot Plant (WIPP). D'Appolonia Proj. No. NM79-287-104, July 1979 (For Westinghouse Elec. Corp., Albuquerque, NM).
- Davenport, J.H. 1986. The law of high-level nuclear waste. *Tenn. Law Rev.* 53(3): 481-526.
- Desert Research Institute, 1982. An Archeological Reconnaissance of the NNWSI Yucca Mountain Project Area, Southern Nye County, Nevada. Social Sci. Center Publ. No. 28, DRI, Univ. of Nevada, Las Vegas.
- EG&G Energy Measurements. 1981. Annotated Bibliography for Biologic Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada. EGG-1183-2419, Dec. 1981, Santa Barbara Operations, Goleta, Calif.
- _____. 1982. Biologic Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada. EGG-1183-2460, Jan. 1982, Santa Barbara Operations, Goleta, Calif.
- _____. 1983. 1982 Biotic Survey of Yucca Mountain, Nevada Test Site, Nye County, Nevada. EGG-10282-2004, Feb. 1983, Santa Barbara Operations, Goleta, Calif.
- _____. 1984a. Evaluation of Habitat Restoration Needs at Yucca Mountain, Nevada Test Site, Nye County,

Nevada. EGG-10282-2030, April 1984, Santa Barbara Operations, Goleta, Calif.

. 1984b. 1983 Biotic Studies of Yucca Mountain, Nevada Test Site, Nye County, Nevada. EGG-10282-2031, April, 1984, Santa Barbara Operations, Goleta, Calif.

. 1985. 1984 Biotic Studies of Yucca Mountain, Nevada Test Site, Nye County, Nevada. EGG-10282-2057, Feb. 1985, Santa Barbara Operations, Goleta, Calif.

Loux, R.R. 1987. Politics, science and nuclear waste: A problematic mix for Nevada. Nevada Gov. Today 13(1): 7-9.

Malone, C.R. 1987. Environmental compliance planning for the U.S. DOE Salt Repository Project in Texas. The Environ. Professional 9(2): 165-178.

Mozingo, H.N. and M. Williams. 1980. Threatened and Endangered Plants of Nevada. U.S. Fish and Wildlife Service and U.S. Bureau of Land Management, Reno, NV.

Mussler, R.M. 1984. Environmental assessments required to support nomination of sites. In, Proceedings of the 1983 Civilian Radioactive Waste Management Information Meeting, pg. 243-244, CONF-831217, Feb. 1984, U.S. Dept. of Energy.

Northern Nevada Native Plant Society. 1987. Sensitive Plant Workshop Summary. Northern Nevada Heritage Program, Carson City, Nevada.

Reith, C.C. 1985. Environmental Data Acquisition at the Waste Isolation Pilot Plan: A Chronological Description and Justification Matrix. Contract No. DE-AC04-78AL05346, IT Corp., June 1985, Carlsbad, NM.

and R.F. Kehrman. 1985. Preoperational environmental programs for the Waste Isolation Pilot Plan. In, Waste Management '85, Vol. 1, Univ. of Arizona, Tucson.

Rusche, B.C. 1987. Letter to Gov. R.H. Bryan, Carson City, Nevada. March 18, 1987, U.S. Dept. of Energy.

Sinnock, S. 1984. Implementation of DOE's siting guidelines by the Nevada Nuclear Waste Storage Investigations. In, Proceedings of the 1983 Civilian Radioactive Waste Management Information Meeting, pg. 178-182, CONF-831217, Feb. 1984, U.S. Dept. of Energy.

Strolin, J.C. 1987. Nuclear waste disposal: A national dilemma with significant implications for Nevada. Nev. Public Affairs Rev. (1987) 1: 78-83.

State of Nevada. 1985. Comments on the U.S. Department of Energy Draft Environmental Assessment for the High-Level Nuclear Waste Site at Yucca Mountain. Vol. I and II, March 1985. Nuclear Waste Project Office, Carson City, Nevada.

_____. 1987. Letter to B.C. Rusche, U.S. DOE, with, A Pre-Site Characterization Environmental Survey for the U.S. Department of Energy Nevada Nuclear Waste Site Investigation Project at Yucca Mountain, Nevada; April 7, 1987, Nuclear Waste Project Office, Carson City, Nevada.

U.S. Dept. of Energy (DOE). 1981. Hydrology and Water Resources Overview for NNWSI, Nevada Test Site, Nye County, Nevada. June 1981, NVO-284.

_____. 1983a. Atmospheric Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, Nov. 1983, NVO-269.

_____. 1983b. Preliminary Atmospheric Assessment of a Nuclear Waste Repository. May 1983, NVO-258.

_____. 1983c. A Cultural Resources Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada. Nov. 1983, NVO-266.

_____. 1984a. Draft Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada, Dec. 1984, DOE/RW-0012.

_____. 1984b. A Peer Review of the Nevada Nuclear Waste Storage Investigations: August 23-28, 1981. Feb. 1984, NVO-196-27.

_____. 1985a. Mission Plan for the Civilian Radioactive Waste Management Program, Vol. 1. June 1985, DOE/RW0005.

_____. 1985b. Meteorological Monitoring Plan. July 19, 1985, DOE/NVO10270-5.

_____. 1985c. Ecological Monitoring Program, Jan. - June 1985. DOE/WIPP-85-002.

_____. 1986a. Recommendation by the Secretary of Energy of Candidate Sites for Site Characterization for the First Radioactive-Waste Repository. May 1986, DOE/S-0048.

_____. 1986b. Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada (Vol. 1-3). May 1986, DOE/RW-0073.

_____. 1986c. Annual Site Environmental

Monitoring Report for the Waste Isolation Pilot Plant, CY 1985. April 1986, DOE-WIPP-86-002.

. 1987a. Reference Package for May 5-7, 1987 Environmental Coordinating Group Meeting: Tab B- Minutes of the Jan. 27, 1987 Environmental Coordinating Group Plenary Session. In G.J. Parker Memorandum, Apr. 10, 1987, U.S. Dept. of Energy.

. 1987b. Working Draft: Environmental Monitoring and Mitigation Plan for Site Characterization, Dec. 1, 1986. With Letter from D.L. Vieth to R.R. Loux, Nov. 26, 1986, U.S. Dept. of Energy.

. 1987c. Minutes of the May 5-7, 1987 Environmental Coordinating Group Meeting: Tab P - Handouts, Environmental Planning Working Group. In G.J. Parker Memorandum, June 24, 1987, U.S. Dept. of Energy.

. 1987d. The Department of Energy Environmental Survey. April 7, 1987, J.R. Barker, M.L. Walker, ASEH, (approved by April 9, 1987) U.S. Dept. of Energy.

U.S. Fish and Wildlife Service. 1986. Endangered and Threatened Wildlife and Plants. 50 CFR 17.11 and 17.12, Dept. of Interior, Jan. 1.

APPENDIX A

**Comments of the Nevada Nuclear Waste Project Office on the
December 1, 1986 Working Draft Environmental Monitoring and
Mitigation Plan for Site Characterization for NNWSI**



AGENCY FOR NUCLEAR PROJECTS
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February 23, 1987

Dr. Donald Vieth, Director
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Dear Dr. Vieth:

We appreciate the opportunity afforded by your correspondence of November 26, 1986 to review and comment upon the working draft of "Environmental Monitoring and Mitigation Plan for Site Characterization", dated December 1, 1986. Copies of the EMMP were distributed by my Office to relevant State agencies, representatives of which attended the briefing by your staff on site characterization and the monitoring and mitigation plan process on January 23 in Carson City. We have now received comments on the EMMP from interested State agencies and have consolidated them with our own review, enclosed herewith.

Our principal impression of the EMMP is that it is premature at this juncture of the NNWSI Project for three reasons. First, like the EA, the EMMP is not based upon comprehensive environmental information specific to the Yucca Mountain site. Second, complete and reliable descriptions of field activities to be conducted during site characterization are not yet available. Third, the EMMP is but one of several pieces of the overall DOE environmental program for the NNWSI Project. It is our understanding that the overall program has yet to be formulated and made available.

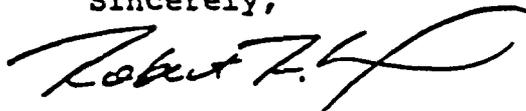
It is unfortunate that DOE believes that it must propose monitoring activities and mitigation measures in the face of inadequate environmental information and incomplete project descriptions upon which to base credible assessments of potential impacts. Not having a comprehensive understanding of either the existing environment that DOE proposes to monitor or the attributes of the NNWSI project that could result in impacts tends to discredit the agency's attempts at environmental protection. This plus the lack of an integrated approach to environmental program planning is cause for critics to have little confidence in the capabilities of DOE to conduct a scientifically sound appraisal of the environmental consequences of the Yucca Mountain project.

Accordingly, the State of Nevada believes that it cannot presently assure its citizens that reasonable measures are being taken by DOE to protect the environment. For this reason it is recommended that DOE terminate environmental program planning, including work on the EMMP, until a comprehensive environmental baseline has been established and complete, reliable descriptions are available for site characterization activities. At that time DOE can develop and implement an integrated environmental protection program encompassing monitoring and mitigation.

Without having agreement on the need to establish an environmental baseline and better project descriptions there is little, if any, room for additional dialogue on the EMMP or on other aspects of DOE's piecemeal environmental program. If the concepts, conclusions, and recommendations embodied in our review of the EMMP are unclear we would be pleased to discuss them further.

If you have any questions, please do not hesitate to call upon me.

Sincerely,



Robert R. Loux
Executive Director

RRL:CRM/njc

Enclosure

**STATE OF NEVADA COMMENTS ON THE DECEMBER 1, 1986
WORKING DRAFT ENVIRONMENTAL MONITORING AND MITIGATION
PLAN (EMMP) FOR SITE CHARACTERIZATION**

1.0 Introduction

This review of the draft EMMP incorporates comments of other State of Nevada agencies with those of the Nuclear Waste Project Office (NWPO). Remarks are organized into two categories, the first consisting of views on the concept and approach taken by DOE in preparing the EMMP, and the second providing comments on individual sections of the document.

2.0 General Comments

The EMMP is constrained by three fundamental limitations that compromise its goal of contributing to environmental protection at the Yucca Mountain site. These weaknesses point to the premature nature of the EMMP as a useful component of the NNWSI Project, as discussed below.

2.1 Absence of a Site Specific Environmental Data Base

A limited amount of data specific to the Yucca Mountain site are available for planning environmental protection programs. With the exception of partial biotic surveys, insights to hydrology, and a reconnaissance of archeological resources reported in the Final Environmental Assessment (EA), existing environmental conditions at the site are not known. The EMMP, as was true of the EA, relies largely upon information in the literature about environments similar or proximate to Yucca Mountain. In particular there is little or no comprehensive information on soil characteristics and erosion potential, seasonal and area-wide occurrences of all species of special interest to the State of Nevada, conditions important to site reclamation, air and potable water quality characteristics, environmental noise, and visual aesthetics.

Without a description of baseline environmental conditions at the site prior to initiation of site characterization activities:

1. sensitive components of the environment that may be particularly susceptible to impact cannot be identified; and
2. monitoring specifically addressed to such issues cannot be developed.

Not only will it be impossible to know where to monitor impacts but significant impacts that may occur cannot readily be recognized because no basis will exist for distinguishing them from non-impact conditions. Likewise, mitigation and site reclamation cannot be effective because without knowledge of the conditions to be maintained or restored, only those actions derived in a subjective manner can be implemented.

On this basis, the State of Nevada believes that the first step to be taken toward environmental protection at Yucca Mountain is to establish a comprehensive site specific baseline that describes the existing environment prior to any disturbances being incurred during site characterization.

2.2 Incomplete Site Characterization Plan (SCP)

While the EMMP provides more information than was available in the EA with regard to the nature of site characterization activities, there remains an insufficient amount of detail on location, schedule, sources of contaminants, extent of areas to be disturbed, and numerous other kinds of essential project design plans. The absence of such information prevents definitive planning for environmental protection because the degree of potential perturbation to the environment cannot be predicted with adequate confidence to know where, when, and how to design impact monitoring and mitigation measures.

The State of Nevada believes that DOE should defer further planning on impact monitoring and mitigation until dependable insights exist into the full extent and nature of activities to be conducted during site characterization. This will be achieved when the SCP is issued.

2.3 Lack of a Comprehensive and Integrated Environmental Program

Although no details are provided the EMMP acknowledges that impact monitoring and mitigation comprise only one component of a multi-faceted environmental program eventually to be implemented by DOE for the Yucca Mountain project. It even is stated in the document that monitoring in addition to that alluded to in the EMMP will be performed under other components of the environmental program. It is impossible to comment on the adequacy of the proposed environmental protection measures proposed in the EMMP without first having an understanding of the scope of all components of the DOE program. An example of this is in regard to radiological monitoring which will be addressed in the DOE "Project Radiological Monitoring Plan" currently in preparation.

Accordingly, the State of Nevada believes (as stated in Section 2.2) that the current DOE approach to environmental planning on a piecemeal basis is inadequate and that work on the EMMP should cease. In its place should be a comprehensive environmental protection plan that integrates monitoring and mitigation within the context of acquiring baseline information and planning for regulatory compliance and site reclamation as intended by Section 113 of the Nuclear Waste Policy Act (NWPA).

3.0 Specific Comments by EMMP Section

Below are addressed comments on individual sections of the draft EMMP. Most of the points raised are related to the three issues discussed above. Particular attention is called to additional issues outside the context of the preceding section.

3.2 "Introduction" - EMMP Section 2

The Introduction to the EMMP abundantly supports the conclusions that the EMMP is premature due to the lack of insights to other important aspects of environmental protection and because it is out of context with the remainder of the program. This issue arises on page 2-4 where it is stated that "the EMMP is only one part of a total comprehensive environmental program and does not represent all monitoring activities planned". Again, on page 2-8 the EMMP states that later it "could include data acquired from monitoring activities conducted during site characterization under other parts of the environmental field program." Further, on page 2-8 the following statement is made: "The plan will specify monitoring details to be used during site characterization." It is therefore clear that:

1. at this time the EMMP is not coordinated with the overall DOE environmental program;
2. other monitoring activities yet unplanned may subsequently influence the EMMP; and
3. details on monitoring procedures cannot yet be specified because of the absence of critical information on other DOE activities.

An attempt is made in the EMMP to exclude site reclamation as a mitigation measure with a statement at the bottom of page 2-8 that mitigation will be limited to "those changes in site characterization activities that serve to avoid or minimize . . . impacts." Yet page 2-9 acknowledges that if residual impacts persist "additional mitigative measures" will be considered. It is difficult to conceive of additional steps toward mitigation beyond avoidance and minimization that would not involve reclamation. This argues strongly for the concept of reclamation to be incorporated as a mitigation measure. Otherwise a reclamation component eventually will have to be added to the already overly fractionated environmental program.

Aside from the issue of prematurity, the Introduction to the EMMP gives rise to the question of cumulative impacts by adopting Council on Environmental Quality (CEQ) regulations for determining impact significance. This occurs on the last paragraph on page 2-3 which references 40 CFR 1508.27. Section 1508.27(b)(7) of the CEQ regulations addresses cumulative impacts, which for the Yucca

Mountain site should cover combined impacts from present and future actions at NTS and Nellis AFB as well as impacts from BLM activities. Cumulative impacts to ground-water resources from piecemeal planning by USAF, BLM, and DOE in the vicinity of Yucca Mountain have never been addressed and constitute a weakness in the environmental review process for the site. The State of Nevada believes that DOE should address cumulative impacts when it complies with the requirement of NWSA Section 113(a) to include environmental impact assessment in the SCP.

3.3 "Site Characterization Program Summary" - EMMP Section 3

As noted in Section 2.2 of these comments, the EMMP adds to the information available on descriptions of site characterization activities. However, this remains inadequate for developing reliable plans for monitoring and mitigation as DOE recognizes in the first paragraphs on page 3-1 where the EMMP cautions the reader to "bear in mind" that some of the information in the EMMP is preliminary and subject to change. This is another of the indications that the EMMP is premature and argues strongly for deferring additional consideration of monitoring and mitigation until more definitive site characterization plans are available. Other instances in Section 3 of the EMMP where this issue arises are as follows:

1. Scales for maps are needed in Figures 3-1 and 3-2. The access roads discussed on page 3-7 are not shown on the maps and this is crucial for considering the location and extent of surface area to be disturbed. This issue arises throughout Section 3 of the EMMP because of confusing and conflicting information on the amount of land to be disturbed.
2. The second sentence under Section 3.1.3 on page 3-8 refers to "an approved landfill on the NTS." Information on the chemical characteristics of the waste fluids approved for disposal in the landfill during site characterization is needed as is a description of leachate monitoring approved for the landfill.
3. Chemical tracers and well injections are mentioned on page 3-9 but there is no information on the nature and quantity of materials involved. Potential impacts of such practices could not have been reliably evaluated by DOE without such information.
4. Pump tests and discharges are discussed on pages 3-9 and 3-11. No attempt is made to estimate the total amount of water to be pumped and to evaluate its significance in the context of water usage estimates reported in the EA. Water supply and water rights for NNWSI are of vital concern to the State of Nevada and DOE has yet to provide accurate information concerning locations of existing and planned wells, estimated

annual water demand, and methods and plans for drilling and constructing new wells.

5. Hydrofracturing via injection of muds is mentioned on page 3-11 but there is no information on where it will occur and the nature and quantity of muds to be used. This gives rise to suspicion that the potential impacts were not fully evaluated by DOE but instead were dismissed in a cavalier manner as seems to be the case with the aforementioned chemical tracers.
6. Page 3-12 discusses drilling fluids and wastes to be disposed of in pits but fails to mention whether or not the pits will be lined, how many there will be, whether or not the pits will be reclaimed, whether or not wastes will be removed, the chemical nature of the fluids, and whether or not the wastes are classified as hazardous materials. If DOE is ignorant on these matters it stands to reason that environmental impacts of the wastes involved could not have been fully evaluated.
7. Water, sewage, and electrical systems are mentioned on page 3-15 as are a rock-storage pile, a mine wastewater pond, and a concrete-batch plant. Detailed engineering design plans are needed to evaluate the pollution and impact potential of all these facilities; an atmospheric emissions inventory is needed for the concrete plant; and, descriptions of the quantity and quality of liquid wastes to be disposed of in the pile and pond are needed. If any chemical or industrial wastes will be disposed of in the sewage system those wastes should be described in detail. The fact that this information is not discussed in the EMMP strongly implies that DOE has not properly considered it in its impact evaluation and planning for appropriate monitoring measures.

The types of information noted above must be on hand for NWPO to evaluate the DOE impacts analyses and proposed monitoring activities and mitigation measures. It is irresponsible for DOE to expect that any environmental protection plan could go forward without such information, and the fact that it has leads the State of Nevada to suspect that DOE failed to utilize such information for the draft EMMP. The State of Nevada therefore believes that work on monitoring and mitigation plans as well as on other aspects of environmental protection should cease until such details are available in the SCP.

3.4 "Potentially Significant Adverse Environmental Consequences Identified for site Characterization Activities" - EMMP Section 4

It is acknowledged on page 4-1 of the EMMP that there is a lack of site specific environmental baseline data to support both the EA and the EMMP. On page 4-3 the issue of variability in impact analyses is raised to denote the degree of uncertainty that

exists due to several factors. The State of Nevada believes that in the face of an absence of baseline information all impact analyses are uncertain and subject to an unacceptably high degree of variability. When the uncertainty associated with the lack of descriptions of site characterization activities is also considered, the potentially inherent variability discredits the draft EMMP and the current DOE approach to planning for impact monitoring and mitigation.

Page 4-2 in the EMMP refers to changes in site characterization plans and states that conclusions in the EA regarding environmental impacts were re-examined. The EMMP should document the changes and evaluate their consequences. Similarly, there should be discussion of how the impact analyses were re-examined. Any additional analyses performed in light of changes in the proposed site characterization activities should be described in detail. As it now stands there is no evidence to support the contention on the part of DOE that a re-examination of potential impacts actually occurred.

The issue of the EMMP being out of context with the overall environmental program arises on pages 4-2 and 4-3. In the first instance it is noted that the EMMP "represents only one set of environmental field studies to be implemented", but no insights are provided to the additional studies. In the second case, mention is made of environmental factors not covered by monitoring requirements but there is no indication as to what these factors are or how they will be addressed in DOE's overall environmental protection program. The State of Nevada believes that in light of such statements there is little need to proceed with evaluating the EMMP and other piecemeal components of the DOE environmental protection program until a comprehensive view is available.

As to the validity and adequacy of the results of the impact analyses for individual components of the environment discussed in Sections 4.1 through 4.9 of the EMMP, NWPO cannot comment in detail until a site specific baseline and the SCP are available. The following observations, however, are made.

1. In Section 4.1 no monitoring of land use is proposed, yet in Section 4.2 there are plans to do aerial photographic monitoring of terrestrial ecosystems. Because the land at Yucca Mountain is all natural ecosystem and that is its sole use, the remote monitoring proposed for ecosystems also serves as land use monitoring. This fact should be acknowledged.
2. Exploratory shaft emissions are mentioned on page 4-8 but no estimates of quality or quantity are given. The lack of a comprehensive emissions inventory for Section 4.3 renders the discussion of air quality pointless. Also, comparative impacts of various methods of dust suppression, e.g., water sprinkling versus use of chemical agents, should be discussed.

3. In Section 4.4 no monitoring is proposed either for disposal ponds and the septic leach field or for consequent impacts to ground water. The lack of ground-water monitoring in both the saturated and unsaturated zones is not acceptable to the State of Nevada. Statements in Section 4.4 of the EMMP that no potential impacts will occur do not agree with the impact analysis matrix on page 4-4. A comparison should be made of the merits of a septic leach field versus an evaporation pond for disposal of sewage effluent.
4. Section 4.5 concludes that there will be no impacts to soils, which is inconsistent with Figure 4.1, page 4-4. Soil cannot be removed and stockpiled without seriously disrupting its composition, nature, structure, and chemical and biological integrity. Impacts will occur, and without the proper baseline analyses of soil characteristics the consequences cannot be predicted. Moreover, soils cannot be reclaimed without detailed information on their pre-disturbance nature. For these reasons failure to characterize and monitor soils is not acceptable.
5. Section 4.7, page 4-12, proposes no monitoring for aesthetics. However, no viewshed analysis of the site has been performed to support the finding of no impact upon which the decision not to monitor was based.
6. Section 4.8 states that the Memorandum of Agreement being negotiated for archeological resources will embody monitoring. That is true only if resources occur at locations to be disturbed, in which case excavation and recovery will take place. All other known archeological sites will not be recovered or protected from potential vandalism resulting from an increase in people at Yucca Mountain and enhanced accessibility to the site. To protect such resources determinations of eligibility must be made on all sites, either individually or as a district, prior to initiating site characterization. In consultation with the State of Nevada DOE can then prepare and implement data recovery plans that mitigate impacts to sites that will be directly and indirectly impacted by any further activities at Yucca Mountain.
7. On page 5-9 there is a statement which predicts no significant impacts on Native American resources. The State of Nevada finds no basis of support for that position because DOE has yet to consult with Native Americans and to undertake research to confirm the presence or absence of significant sites at Yucca Mountain.
8. Section 4.11 states on page 4-17 that utilities for NNWSI will be provided by DOE facilities on the Nevada Test Site (NTS) and are not expected to cause significant impacts. However,

EMMP Section 3.2.4 and Figure 3-4 describe new utility construction at the Yucca Mountain site for water supply distribution, sewage disposal, and electrical transmission. There apparently has been no evaluation of the consequences of these operations to such issues as allocated water rights, leaching and ground-water contamination from the septic field, and construction of new electrical transmission facilities. The State of Nevada does not agree that the existence of utilities at NTS implies that new facilities at the Yucca Mountain site will have no environmental impact. At a minimum the design plans for the facilities to be constructed must be reviewed and DOE must demonstrate through its prior acquisition of appropriate permits and other regulatory approvals that the utilities at NTS were designed and are being operated in accordance with sound environmental protection practices and standards.

3.5 "Environmental Monitoring and Mitigation" - EMMP Section 5

The monitoring activities and mitigation measures proposed by DOE in Section 5 of the EMMP are lacking in credibility because they are based upon the preliminary environmental impact analyses reported in the EA that were conducted in the absence of baseline information and complete descriptions of site characterization activities. Without information on where surface disturbance and other environmental perturbations will occur monitoring measures cannot be taken. This dilemma is acknowledged in the EMMP on page 5-4 where it is noted that survey procedures for sensitive species "will be determined when plans for site activities are finalized."

Another example of incomplete information occurs in EMMP Section 5.10, Radiological Levels, which for more detail on radiological monitoring plans references a draft NNWSI Project Preliminary Site Characterization Radiological Monitoring Plan and a NNWSI Project Radiological Monitoring Plan that is being prepared. The State of Nevada has never received and reviewed the draft plan and therefore has had no input to the final plan being prepared to replace it nor has there been an indication that the State would be asked for comments.

Such difficulties are encountered throughout the subsections of EMMP Section 5 that address monitoring plans for individual components of the environment. Consequently, the State of Nevada believes that there is no point to further work on impact monitoring and mitigation until more information on site characterization, monitoring, and other program planning that DOE currently has underway is available and shared with the State.

A particularly weak aspect of Section 5 that bears commenting on is with respect to the discussion on page 5-3 of "in-place procedures for DOE operations in the region" and "good engineering practices." Revegetation and habitat restoration are mentioned as

examples of where DOE is practicing such measures, but no details are provided on how this would be accomplished for NNWSI. The State of Nevada is not aware that DOE has taken steps to implement the recommendations of its ecological field contractor, EG&G, for further biological studies including site restoration practices. This is one of the few areas where DOE has some site specific data available to it, and it has not followed the recommendations that resulted from the investigations.

Such oversights as this, the lack of baseline information and complete descriptions of proposed actions, and the superficial measures proposed for monitoring mitigation render the proposed measures in the EMMP inadequate and unacceptable to the State of Nevada.

3.6 "Methodology for Modifying the Environmental Monitoring and Mitigation Plan" - EMMP Section 6

The first paragraph of Section 6 of the EMMP implies that the document will be issued in final form along with the SCP. A statement also is made that discussions will be held on "the need to modify current monitoring studies or mitigation procedures." The State of Nevada believes that a final EMMP must not be issued until after the SCP has been evaluated, a site specific environmental baseline for Yucca Mountain has been established, and potential impacts have been reviewed on the basis of those sets of information. There is no point in discussing modifications to the December 1, 1986 working draft EMMP because it is completely without validity and there currently are no means for overcoming its deficiencies.

The scheme proposed by DOE for modifying "individual monitoring programs as warranted" via semi-annual progress reports for the EMMP is unacceptable because it condones and continues to perpetuate the segregated and fragmentary approach to environmental protection that currently exists in DOE. While it is recognized by the State of Nevada that modifications to monitoring activities and mitigation measures will be essential, there is no foundation for considering what the minimal requirements are. Moreover, there is no basis for establishing a point of departure for such considerations because adequate baseline environmental information and reliable description of proposed site characterization activities do not exist. That theme is consistently repeated throughout these comments. A corollary theme is that DOE must address environmental protection in a comprehensive and integrated manner by having a composite program that considers not only monitoring and mitigation but also a review of the preliminary impact assessments reported in the EA, plans for complying with environmental regulations, and plans for site reclamation.

This view is consistent with the requirements of NWPA Section 113 which mandates that environmental assessment and

decommissioning and decontamination planning be part of the SCP. It is in the context of the SCP that the State of Nevada believes DOE must address environmental protection, and to this end it is recommended that DOE cease work on the EMMP as it presently is conceived, undertake steps to obtain the needed baseline information and descriptions of site characterization activities, and develop an integrated environmental program that demonstrates a responsible and credible approach to protecting the environment at the Yucca Mountain site. This view stands as the conclusion of the State of Nevada review of the draft EMMP.

February 27, 1987
njc

APPENDIX B

The Environmental Quality Siting Guideline, 10 C.F.R. Part
960.5-2-5

§ 960.5-2-5 Environmental quality.

(a) *Qualifying Condition.* The site shall be located such that (1) the quality of the environment in the affected area during this and future generations will be adequately protected during repository siting, construction, operation, closure, and decommissioning, and projected environmental impacts in the affected area can be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors; and (2) the requirements specified in § 960.5-1(a)(2) can be met.

(b) *Favorable Conditions.* (1) Projected ability to meet, within time constraints, all Federal, State, and local procedural and substantive environmental requirements applicable to the site and the activities proposed to take place thereon.

(2) Potential significant adverse environmental impacts to present and future generations can be mitigated to an insignificant level through the application of reasonable measures, taking into account programmatic, technical, social, economic, and environmental factors.

(c) *Potentially Adverse Conditions.* (1) Projected major conflict with applicable Federal, State, or local environmental requirements.

(2) Projected significant adverse environmental impacts that cannot be avoided or mitigated.

(3) Proximity to, or projected significant adverse environmental impacts of the repository or its support facilities on, a component of the National Park System, the National Wildlife Refuge System, the National Wild and Scenic Rivers System, the National Wilderness Preservation System, or National Forest Land.

(4) Proximity to, and projected significant adverse environmental impacts of the repository or its support facilities on, a significant State or regional protected resource area, such as a State park, a wildlife area, or a historical area.

(5) Proximity to, and projected significant adverse environmental impacts of the repository and its support facilities on, a significant Native American resource, such as a major Indian religious site, or other sites of unique cultural interest.

(6) Presence of critical habitats for threatened or endangered species that may be compromised by the repository or its support facilities.

(d) *Disqualifying Conditions.* Any of the following conditions shall *disqualify* a site:

(1) During repository siting, construction, operation, closure, or decommissioning the quality of the environment in the affected area could not be adequately protected or projected environmental impacts in the affected area could not be mitigated to an acceptable degree, taking into account programmatic, technical, social, economic, and environmental factors.

(2) Any part of the restricted area or repository support facilities would be located within the boundaries of a component of the National Park System, the National Wildlife Refuge System, the National Wilderness Preservation System, or the National Wild and Scenic Rivers System.

(3) The presence of the restricted area or the repository support facilities would conflict irreconcilably with the previously designated resource-preservation use of a component of the National Park System, the National Wildlife Refuge System, the National Wilderness Preservation System, the National Wild and Scenic Rivers System, or National Forest Lands, or any comparably significant State protected resource that was dedicated to resource preservation at the time of the enactment of the Act.

APPENDIX C

**Issue 3.1 From the U.S. DOE Mission Plan for the Civilian
Radioactive WasteManagement Program, Vol. 1. June 1985, DOE/RW-0005**

ISSUE 3.1: *Can a site be located such that the quality of the environment will be protected during repository siting, construction, operation, closure, and decommissioning and can significant adverse environmental impacts in the affected area be mitigated by reasonable measures?*

Environmental impacts will be considered throughout all stages of the geologic repository program, and unavoidable adverse impacts will be mitigated to the extent practicable. The affected area can depend on the site and on the impact being considered. For example, the affected area for air quality impacts may differ from that for water quality impacts. As a rule, the affected area will include the repository area and extend outward from the repository area far enough to include impacts perceptibly above background levels. The environmental conditions that will disqualify a site are given in preclosure technical guideline 960.5-2-5, which also identifies a number of potentially adverse and favorable conditions.

To address this issue, it is necessary to establish a data base for existing environmental conditions at the potential site. These data will be used to predict potential impacts; to determine what measures must be taken to prevent, control, and mitigate the impacts; and to ensure compliance with all applicable Federal, State, and local environmental regulations and standards.

The needed baseline data include the following:

- 3.1.1 Existing air-quality levels and trends.
- 3.1.2 Existing surface-water and ground-water quantity and quality and trends.
- 3.1.3 Existing terrestrial and aquatic vegetation and wildlife, including evidence of threatened or endangered species and their critical habitats.
- 3.1.4 Soil characteristics, such as structure, composition, and erodability.
- 3.1.5 Existing levels of background radiation.
- 3.1.6 Land use patterns and trends.
- 3.1.7 Noise levels.
- 3.1.8 Locations of State or regional protected-resource areas, such as State parks or wildlife areas.
- 3.1.9 Locations of significant Native American resources, such as major Indian religious sites, or other sites of unique cultural interest.
- 3.1.10 Locations of components of the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Wildlife Preservation System, and National Forest Land.
- 3.1.11 Other unique environmental resources, as they become identified.

APPENDIX D

NNWSI Project: Summary of Ongoing and Planned Site
Characterization Activities for the Candidate Site at Yucca
Mountain, Nevada: May 1986 - April 1987



Department of Energy
Washington, DC 20585

MAR 13 1987

RECEIVED

MAR 10 1987

NUCLEAR WASTE PROJECT OFFICE

Mr. Robert R. Loux, Executive Director
Agency for Nuclear Projects
Nuclear Waste Project Office
Capitol Complex
Carson City, Nevada 89710

Dear Mr. Loux:

Enclosed is a copy of the report entitled Nevada Nuclear Waste Storage Investigations Project Summary of Ongoing and Planned Site Characterization Activities for the Candidate Site at Yucca Mountain, Nevada. This report was prepared by the Nevada Nuclear Waste Storage Investigation Project (NNWSI) in response to agreements reached between the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) to provide letter reports describing ongoing site characterization studies at the two Federal sites. No new site characterization studies have been initiated at the NNWSI Project site since its identification as a candidate for characterization in May 1986. Stop work orders were issued to ensure that the appropriate quality assurance program has been implemented before site characterization data collection begins. When the stop work orders are released and if any new site characterization studies are initiated at the NNWSI Project site before the Site Characterization Plan (SCP) is issued, study plans will be provided for review by the State and NRC in advance.

It is DOE's intention that exploratory shaft study plans will be released along with the NNWSI Project SCP. To the extent possible, study plans for other activities scheduled for initiation during the first year after SCP issuance will be released with the SCP as well.

Drafts of NNWSI Project SCP Chapters 1-7 are being forwarded to your office for your information and assistance in becoming familiar with the document before its anticipated release in midsummer. DOE representatives would be pleased to meet with you at your request to discuss these chapters.

If you have additional questions regarding the subject report, NNWSI Project's study plans, or the draft copies of Chapters 1-7, or if you would like to arrange a meeting to discuss Chapters 1-7, please contact Dr. Donald Vieth, Project Manager, at (702) 295-3662.

Sincerely,



for Stephen H. Kale
Associate Director for
Geologic Repositories
Office of Civilian Radioactive
Waste Management

Enclosure

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NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT
SUMMARY OF ONGOING AND PLANNED SITE CHARACTERIZATION
ACTIVITIES FOR THE CANDIDATE SITE AT
YUCCA MOUNTAIN, NEVADA
May 1986 - April 1987

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MARCH 1, 1987

NNWSI PROJECT
SUMMARY OF ONGOING AND PLANNED SITE CHARACTERIZATION
ACTIVITIES FOR THE CANDIDATE SITE AT
YUCCA MOUNTAIN, NEVADA
May 1986 - April 1987

1.0 Preface

The Nuclear Waste Project Act (NWSA) of 1982 requires that the Department of Energy (DOE) prepare and issue a Site Characterization Plan (SCP) to the Nuclear Regulatory Commission (NRC) and to affected States and Indian Tribes before sinking exploratory shafts (ES) at any candidate sites. While site characterization activities related to the exploratory shaft facility (ESF) will not be initiated until after the issuance of the SCP, some surface - based activities are ongoing or may be initiated before issuance of the SCP.

During the May 7-8, 1986, NRC DOE meeting on the level of detail for site characterization plans and study plans, the DOE agreed to prepare a letter report describing these ongoing and planned site characterization activities for the States and Indian tribes. Ongoing activities are defined as site characterization activities, as defined by NWSA, that were in progress at the time of Presidential Approval (May, 1986). Planned activities are defined as site characterization activities, as defined by NWSA, that have been started, or are planned to be started, after Presidential approval, but before the expected date of SCP issuance (April, 1987).

2.0 Introduction

According to the NWSA of 1982, site characterization refers to those research activities, whether in the field or in the laboratory, that are undertaken to establish the geologic condition and the range of parameters relevant to an evaluation of the suitability of a candidate site. Yucca Mountain became a candidate site on May 28, 1986, with the President's approval of the recommendation by the Secretary of the DOE. This recommendation was accompanied by a final Environmental Assessment pursuant to the NWSA.

Site characterization activities that take place in the field include mapping, geophysical surveys, borings, surface excavations, excavation of exploratory shafts, subsurface lateral excavations and borings, and in situ testing. Laboratory activities include measurement of thermal, mechanical, and hydrological rock properties; analysis of gas and water samples and fossil plant material; detailed mineralogic and petrologic analyses; and geochemical studies under conditions simulating the repository environment. Office activities include modeling and data reduction and analysis. Excavation of an exploratory shaft and in situ testing at the depths of waste emplacement are required by the NRC (10 CFR 60.10(b)), and were described in the DOE Mission Plan.

2.1 The Nevada Nuclear Waste Storage Investigations (NNWSI) Project Site Characterization Plan (SCP).

Site information gathered during the 1978 to 1984 time frame was used to prepare the EA and to evaluate the site against the DOE siting guidelines. Site investigations completed before Presidential approval (May 1986) but not reported in the EA will be described in the SCP, tentatively scheduled for issuance in April 1987.

Data Chapters 1 through 5 of the NNWSI Project SCP will establish the current understanding about the Yucca Mountain site with regard to Geology (Chapter 1), Geoengineering (Chapter 2), Hydrology (Chapter 3), Geochemistry (Chapter 4), and Meteorology and Climate (Chapter 5). Current conceptual designs for the repository and waste package are provided in Chapters 6 and 7, respectively. Results from ongoing studies and design activities available too late for incorporation into the SCP will be reported in the semiannual Progress Reports.

Chapter 8 of the SCP contains a description of plans for site characterization activities. Section 8.1 of the SCP describes the rationale for the planned site characterization program, while Section 8.2 discusses the technical and regulatory issues that are to be resolved during site characterization. Section 8.3 is the Plans section of the SCP and is structured on the basis of Issues and Information Needs, using the NNWSI Project Issues Hierarchy. Section 8.4 describes the plans for site preparation for the surface and subsurface excavations at the exploratory shaft location and a description of the exploratory shaft and underground test facilities. Section 8.5 reviews the milestones and decision points in the site characterization program up to submittal of the license application. Section 8.6 provides a description of the Quality Assurance Program for the Project, and Section 8.7 describes the plans for decontamination and decommissioning of the candidate site if the site is not selected for development as a repository. Enclosure 1 provides a working copy of the structure of Chapter 8.

Details of planned in situ testing in the Exploratory Shaft will be described in the SCP and in Study Plans, which will provide supporting material of the Yucca Mountain SCP.

2.2 The NNWSI Project Issues Hierarchy.

The Issues Hierarchy is the means by which the NNWSI Project has abstracted and organized the repository siting and licensing requirements into a hierarchical structure of Key Issues, Issues, and Information Needs. This hierarchical structure provides a means to distinguish broad questions of overall suitability (Key Issues) from more specific questions (Issues). Some questions in the regulations governing repositories deal with performance objectives or regulatory standards; other questions deal with favorability or standard operating practices and procedures. In addition, some questions in the regulations deal with postclosure time frames, while others only deal with the preclosure period. Key Issues are related to broad technical or institutional requirements pertaining to the performance of the site with respect to compliance with applicable regulations. Issues are subordinate to Key Issues. Collectively, the group

of Issues under a Key Issue indicates what questions must be resolved to satisfy the Key Issue. The Issues are also generally readily identifiable as elements of the regulations. Information Needs are subordinate to Issues and identify the specific information, data, and analyses needed to resolve the Issues.

Issues within each Key Issue in the NNWSI Project Issues Hierarchy are grouped into Characterization, Design, and Performance Issues. The separation of topics according to preclosure and postclosure time frames is automatic, because the Key Issues explicitly make the time frame distinction. Characterization Issues encompass the site characteristics, processes, and events that may affect repository design and performance. They include detailed information on the geologic, hydrologic, and other site characteristics. Design Issues address needs for information about the design of the geologic repository operations area and its associated surface facilities and underground facility. Performance Issues address the analyses necessary to assess the suitability of the Yucca Mountain site and its proposed repository facilities as a licensable repository system. Performance Issues encompass the requirements placed on the behavior of the repository system. Key Issue 3 is not included because it represents the environmental regulatory requirements and Information Needs, and covers monitoring and mitigation efforts. Key Issue 3 will be fully developed after the Environmental Impact Statement (EIS) scoping meetings and hearings are completed.

Information Needs were used as the basis for defining the field and laboratory investigations to be conducted during site characterization. Each Information Need described in Section 8.3 of the SCP will be presented according to a standard format:

1. A list of the data and parameters to be collected to satisfy the Information Need.
2. A discussion of the logic tying the data and parameters together.
3. A description of the studies and activities planned to collect the data and parameters for the Information Need.
4. A discussion of where the data and parameters will be used as input to other Information Needs.
5. A preliminary list of planned milestones and schedules for completion of the activities and studies.

2.3 Purpose

The purpose of this report is to summarize site characterization activities at the candidate site at Yucca Mountain, Nevada, for ongoing activities and the status of planned activities. This summary is provided in response to agreements between the DOE and the NRC resulting from the May 7-8, 1986 meeting. A more comprehensive discussion will follow in the SCP.

This summary concentrates on surface-based activities, which include all field activities defined by the NWPA as site characterization activities (e.g., drilling, drillhole testing and monitoring, trenching, mapping, and surveying at the Yucca Mountain site and surrounding region) that are not directly related to the ESF. Site Characterization activities related to the ES will not be initiated until after the SCP is issued. In addition, prototype testing which is not a part of site characterization, is not included in this summary. Geochemical and thermomechanical laboratory testing related to field activities are described, as well as meteorological studies. A brief technical rationale for each activity is provided, and activities are cross-referenced to the appropriate sections in the SCP.

This report is divided into two sections: ongoing site characterization activities and planned activities.

3.0 Ongoing Site Characterization Activities: Description and Rationale

Site investigation activities were initiated in 1978 when the NNWSI Project began to focus on tuff at Yucca Mountain as a potential repository host rock. The DOE identified Yucca Mountain as a potentially acceptable site in February 1983. Publication of the final EA for the Yucca Mountain site (May 1986) establishes that the site is suitable for site characterization. It is expected that some of the previously initiated activities will continue or be completed during the time between Presidential approval of the site recommendation, and issuance of the SCP. Examples of such activities include seismic monitoring, hydrologic monitoring, meteorologic monitoring, geodetic surveys, and laboratory analyses of degradable and irreplaceable samples. Office activities include modeling and data reduction and analysis of available data. Brief descriptions of each activity are given below.

3.1 Hydrologic Activities.

Various hydrologic activities have been initiated to establish the moisture conditions of the unsaturated zone, and to determine if recharge is episodic or steady-state. Saturated zone activities have been focused on determining the position of the water table, and on establishing the characteristics of fracture hydrology. The following specific activities, including the data reduction and analyses associated with field-data collection, are ongoing.

3.1.1 Seven holes have been drilled to monitor in situ moisture conditions in the unsaturated zone (Figures 1 and 2). These holes range from 400 to about 2,000 feet deep. One of these holes, USW UZ-1, has been fully instrumented and continuously monitors hydrologic properties of the unsaturated zone. Existing holes UZ-4, 5, 6, 6s, 7, and 13 will be instrumented and monitored. Gas samples are also obtained periodically from UZ-1. UZ-8, which was only partially drilled, will be re-entered, drilled to the planned total depth and instrumented. Re-entering any of these holes may be necessary to acquire additional information using geophysical logging tools and other instrumentation. This activity supports the studies identified in section 8.3.1.2.2 of the SCP.

- 3.1.2 Fourteen boreholes (Figures 1 and 2) were drilled into the saturated zone for the purpose of determining the elevation of the water table at various locations at the site. These boreholes range from about 1,600 to 2,000 feet deep. Water levels in the boreholes are monitored regularly to record fluctuations in water levels as a function of time. Water table levels from the fourteen water table holes were used to establish the hydraulic gradients used to estimate the saturated zone travel times presented in the EA. This activity supports the studies identified in sections 8.3.1.2.1 and 8.3.1.2.3 of the SCP.
- 3.1.3 Seventy-four neutron holes (depths from 50 to 200 feet) have been drilled in the vicinity of the site to monitor the infiltration of precipitation in various geologic settings. Because of the importance of flux estimates in the unsaturated zone, monitoring data on shallow infiltration is used to determine the upper bounds on flux through the repository horizon. The holes are logged periodically with thermal and epithermal neutron tools, and gamma-gamma tools. The locations of the neutron holes are shown in figures 1 and 2. This activity supports studies identified in section 8.3.1.2.3 of the SCP.
- 3.1.4 Nine streamflow gages have been installed in dry washes at and near Yucca Mountain to monitor the surface-water runoff that occurs during and after storms. Streamflow gages provide data to be used in predicting the frequency and magnitude of runoff resulting from heavy precipitation events, which are typical in desert environments. This activity supports studies in sections 8.3.1.5.1, 8.3.1.6.1, and 8.3.1.16.1 of the SCP.
- 3.1.5 Observations of debris-flow movements are being made at the time of occurrence in order to understand the mechanisms of flow and the climatic and other factors that cause them. This effort contributes to the understanding of the conditions under which paleoflood deposits occurred. This activity supports studies identified in sections 8.3.1.5.1 and 8.3.1.6.1 of the SCP.
- 3.1.6 Channel scour chains have been installed at three locations in the Yucca Mountain area to measure the amount of erosion, or scour, that occurs in washes during times of heavy runoff. Heavy runoff events expose successively deeper parts of the chain, thus giving a measure of the amount of sediment movement in the wash. This activity supports studies identified in sections 8.3.1.5.1 and 8.3.1.6.1 of the SCP.
- 3.1.7 Water-level and pressure measurements are being recorded continuously in the three UE-25c boreholes (Figure 2), located in Drill Hole Wash, using a continuously recording data logger to evaluate barometric, tidal, and other time-related effects on water levels. This information is used to provide better understanding of fracture porosity and other aquifer properties. Long-term, continuous recording is required in order to obtain an accurate correlation of the atmospheric pressure versus water-level data. This activity supports studies identified in section 8.3.1.2.3 of the SCP.

- 3.1.8 A mining company is drilling boreholes in the Amargosa Desert as part of its exploration programs. This commercial company have agreed to allow installation of tubing or piezometers in their holes for NNWSI Project data collection purposes. Some tubing and piezometers have been installed to measure water levels in areas adjacent to the Yucca Mountain site in order to provide data for regional hydrologic studies. Additional instruments will be installed if additional holes are made available to the Project. This activity supports studies identified in section 8.3.1.2.1 of the SCP.
- 3.1.9 Measurements of temperature, precipitation, and infiltration are being made at two recharge sites at Pahute Mesa and near Tonopah that are thought to be analogous to the Yucca Mountain site under pluvial climatic conditions. Temperature of the air and soil are continuously recorded on a data logger. Precipitation samples are collected from samplers and sent to the laboratory for stable isotope analysis. The measurements will aid the estimation of ground water recharge rates at the site under future pluvial conditions. This activity supports studies identified in section 8.3.1.5.1 and 8.3.1.5.2 of the SCP.
- 3.1.10 Laboratory testing of crushed tuff for hydrologic and other properties is being conducted for evaluation of sealing materials. Although this effort is necessary for work on sealing concepts, it has only an indirect tie to site characterization.
- 3.1.11 Laboratory measurements of hydrologic properties of existing core and cuttings and water and gas samples are being made to define in situ conditions. Relationships among various hydrologic properties in the unsaturated zone are being identified. This activity supports studies identified in section 8.3.1.2.2 of the SCP.

3.2. Geologic Activities.

The tectonic setting of the Yucca Mountain site is important to its overall suitability as a candidate site. Seismic data and geodetic measurements are both valuable in assessing tectonic setting of the site. The following geologic activities, including the data reduction and analyses associated with field-data collection, are currently ongoing.

- 3.2.1 Fifty-three seismometers (Figure 3) have been installed in the region around Yucca Mountain as part of a regional seismic network, extending in lines trending east-west from the west side of Death Valley to Caliente, and generally north-south from Tonopah to Lake Mead. The two lines intersect near Yucca Mountain. The seismometers are in continuous operation and data are recorded automatically. Data from the seismic network have been used to establish the earthquake catalog for the region (Rogers et al., 1976, 1983), which is essential for predicting the size and frequency of earthquakes that are possible during the pre-

and postclosure time periods. The ability to accurately locate earthquakes is also very important for establishing the activity of faults near the site. This activity supports studies identified in sections 8.3.1.8.2 and 8.3.1.17.3.

- 3.2.2 Ground motions are being measured to define aspects of the design basis for the proposed site for surface facilities near Yucca Mountain. Data from surface and downhole measurements will be used to revise approaches to predicting vibratory ground motion for surface and underground facilities. Motions from underground nuclear explosions (UNEs) are analyzed to develop the relationship between earthquakes and UNEs and for prediction of potential ground motion during repository operation. This activity supports studies identified in sections 8.3.1.8.2 and 8.3.1.17.2 of the SCP.
- 3.2.3 Without accurate benchmarks that are routinely surveyed, it is impossible to establish local rates of vertical or horizontal tectonic movement. Therefore, geodetic survey benchmarks have been permanently installed in and around the Yucca Mountain site in order to monitor present-day tectonic adjustments in the Yucca Mountain area. A 43-mile level line extends from Crater Flat on the west to Rock Valley on the east. A quadrilateral network has been installed across several faults in the immediate vicinity of Yucca Mountain. Biannual resurveys are conducted. These activities support studies identified in sections 8.3.1.8.2 and 8.3.1.17.2 of the SCP.
- 3.2.4 Determination of soil characteristics for purposes of soil modeling are made on a seasonal basis. These include dust-trap sampling, determining field capacity of soils, and periodic measurements of carbon dioxide and soil gases. The soil modeling is part of the overall climate modeling effort that addresses the effects changing climate may have on the hydrologic characteristics of the site. This activity supports studies identified in section 8.3.1.5.1 of the SCP.
- 3.2.5 Several trenches (Figure 4) have been excavated as part of the geologic, tectonic, and paleoclimatic studies. These trenches are sampled and mapped on an ongoing basis. Occasionally, it may be necessary to deepen or lengthen existing trenches to collect additional data and to prevent degradation of the trenches. These activities support studies described in sections 8.3.1.5.1, 8.3.1.8.2, and 8.3.1.17.2 of the SCP.
- 3.2.6 Geologic mapping is continuing in the vicinity of Yucca Mountain as part of the geologic, tectonic and igneous activity studies. This activity includes the collection of samples to provide dates which help to define rates of tectonic and igneous processes. This activity supports studies identified in sections 8.3.1.8.1, 8.3.1.8.2, 8.3.1.17.1 and 8.3.1.17.2 of the SCP.

3.3 Meteorological Activities.

A meteorological monitoring network has been established at the Yucca Mountain site and has been collecting data since December 1985 (Figure 5). Meteorological data is collected at five towers: four are 10 meters high,

and one is 60 meters high. The four 10-meter towers continuously measure and record wind speed, wind direction, sigma theta (standard deviation of wind direction for determining atmospheric stability), relative humidity, and temperature. The fifth tower is instrumented at both the 10-meter and 60-meter levels. The data collected at this tower include the data stated above, plus sigma phi (standard deviation of vertical wind speed), net solar and terrestrial radiation, and precipitation.

These meteorological monitoring activities have begun to provide site-specific data for use in repository design studies, and eventually in the radiological safety assessments required by the NRC (10 CFR Part 60). These activities support studies identified in sections 8.3.1.2, 8.3.1.5.1 and 8.3.1.12 of the SCP.

3.4 Geomechanical Activities.

Laboratory testing, data reduction, and data analysis is ongoing for both thermal and mechanical properties. The next phase of planned testing for thermal properties is the determination of heat capacity of samples of the Topopah Spring Member of the Paintbrush Formation. These measurements are required for predicting the behavior of the host rock under the heat load generated by the waste emplaced in the repository. The next phase of planned mechanical measurements includes low-strain-rate testing, which will help determine the proper constitutive relationships for long-term conditions of the repository, and tensile strength testing, which is relevant to certain repository design analyses.

The NNWSI Project is conducting experiments in the G-Tunnel Underground Facility on Rainier Mesa. Although these experiments are not a part of site characterization, they are ongoing field activities that will guide the planning of the ESF and experiments. Therefore, a short description is provided. A principal ongoing effort in G-Tunnel is a mining evaluation experiment. Instrumented boreholes were used to determine mining-induced rock responses, and to develop improved techniques for controlled blasting in welded tuff. In situ stress and the modulus of deformation for welded tuff are also being determined at the G-Tunnel Facility. A thin slot is cut in the tuff and a flatjack is used to pressurize the side walls, moving them back to their original unrelaxed positions. Measurements obtained through these experiments provide useful experience in preparation for similar activities in the welded tuffs at Yucca Mountain.

These activities support thermomechanical studies and testing to establish repository design constraints and considerations described in section 8.3.1.15 of the SCP. These studies are important for establishing the stability of emplacement holes and drifts, particularly with regard to the requirements for retrievability.

Activities related to measurements of rock properties to be used in predictions of long-term behavior of the potential host rock under the heat load generated by the repository support studies described in section 8.3.1.14 of the SCP. These measurements are important for predicting long term rock mass response and fluid migration due to temperature effects and for establishing whether emplacement holes are likely to remain stable during the retrieval period.

3.5 Geochemical Activities.

Geochemistry of the rocks and water in contact with emplaced waste must be established in order to predict possible interactions for use in determining the lifetime of waste containers, and for predicting radionuclide transport if releases occur. The following activities, and the data reduction and analysis associated with them, are ongoing.

3.5.1 Near-Field Activities. Two types of laboratory activities are being conducted to characterize the expected time- and temperature- dependent conditions in the hydrologic environment immediately adjacent to the waste packages. These investigations are short-term hydrothermal rock-water interaction experiments between samples from the Topopah Spring Member and water from Well J-13, and experiments to determine the rates and mechanisms of dehydration and rehydration of repository near-field rock in response to the expected thermal field generated by the emplaced waste. In addition, experiments are being conducted to measure the rate at which radionuclides released during waste-form tests are picked up by rock wafers and transported through the wafers. These activities support geochemistry studies for characterizing the very near-field waste package emplacement environment identified in section 8.3.4.2 of the SCP. These studies are important for predicting the performance of the metal container, and for establishing expected release rates.

3.5.2 Far-Field Activities.

There are seven laboratory studies being conducted to better characterize geochemical conditions in the far-field. These include dynamic transport, mineralogy/petrology, sorption, natural isotope, ground-water chemistry, solubility, and hydrothermal studies. The first five studies listed involve experimental work using natural samples previously collected from the Yucca Mountain site. The following sections provide a discussion of each of these five studies.

3.5.2.1 Dynamic Transport Experiments.

The objective of the dynamic transport experiments is to determine the rate of movement of radionuclides along potential flow paths from the repository to the accessible environment. Factors under study which may potentially affect rates of movement include diffusion, dispersion, anion exclusion, sorption kinetics, and colloid movement in the flow geometries and hydrologic conditions that are expected to exist at Yucca Mountain. Ongoing transport studies include column experiments using crushed Yucca Mountain tuff, unsaturated solid tuff core, and fractured core. These column studies will provide experimentally determined hydrologic, physical, and chemical parameters needed to determine the rates of movement of various chemical species and aid in the prediction of radionuclide transport. In addition, diffusion experiments are being conducted using tuff wafers and rock beakers made from Yucca Mountain tuff. These experiments support studies described in section 8.3.1.3 of the SCP.

3.5.2.2 Mineralogy-Petrology Activities.

The objectives of the mineralogy-petrology activities are to describe the host rock mineralogy and petrology by establishing the mineralogic and petrographic stratigraphy including the mineralogic variability, and to provide descriptions of rock and fracture-fill petrology and mineralogy along potential transport pathways to the accessible environment. Ongoing activities include (1) studies of the potential for mineral alteration; (2) characterization of the fracture mineralogy using electron microscopy, x-ray diffraction, and radiometric dating on rock samples from cores, outcrops, and trenches; (3) mineral stability studies on clay, zeolites, and glasses that are important to the natural retardation system; and (4) studies of host-rock mineralogy-petrography using samples from drill cores and outcrops. These activities support studies described in section 8.3.1.3.2 of the SCP.

3.5.2.3 Sorption Activities.

The objective of the sorption activities is to provide data as input to the prediction of radionuclide movement from the repository to the accessible environment. Ongoing experiments include batch, crushed tuff column, and circulating column sorption experiments using tuff samples representative of the various mineralogic and stratigraphic characteristics of Yucca Mountain. Sorption coefficients of actinides and other important waste elements will be determined and used to estimate radionuclide retardation. Another sorption task involves studying the effects of microbes on sorption. This task involves determining the growth properties of microbes taken from soil samples collected from drilling locations at Yucca Mountain. Drilling fluids are used as the energy source for microorganism growth. Sorption coefficients of radionuclides on tuff in the presence of microbes will be determined. These activities support studies described in section 8.3.1.3.4 of the SCP.

3.5.2.4 Natural Isotope Chemistry Activities.

The objective of the activities related to natural isotope chemistry is to provide data on infiltration rates at Yucca Mountain. Chlorine-36 to total chlorine ratios are measured in Yucca Mountain soil samples, and changes in the ratio with depth are used to estimate infiltration rates. These activities support studies described in sections 8.3.1.3.1 and 8.3.1.2.2 of the SCP.

3.5.2.5 Ground Water Chemistry Activities.

The objectives of ground-water chemistry studies are to analyze the composition and the geochemical controls of the composition of pore waters in the unsaturated zone and in the saturated zone in and near Yucca Mountain. The saturated zone water chemistry has been well characterized and samples from Well J-13 are being used in the sorption and dynamic transport geochemistry tasks. Characterization

of pore waters from unsaturated zone samples is just beginning. These fluids will be extracted by applying pressure to the core sample, by centrifugation of the crushed core sample, or by vacuum distillation. These activities support studies described in section 8.3.1.3.1 of the SCP.

4.0 Planned Site Characterization Activities

The current schedule for the NNWSI Project assumes that the SCP will be completed in April 1987. At this time, the NNWSI Project does not expect to begin any new site characterization activities prior to issuance of the SCP.

Before any new site characterization activities can be started, the DOE must have appropriate agreements with the Bureau of Land Management for continued land access. DOE must also obtain the necessary environmental permits to comply with all Federal, State, and local environmental requirements during site characterization. In addition, the DOE must prepare study plans in consultation with the State and the NRC.

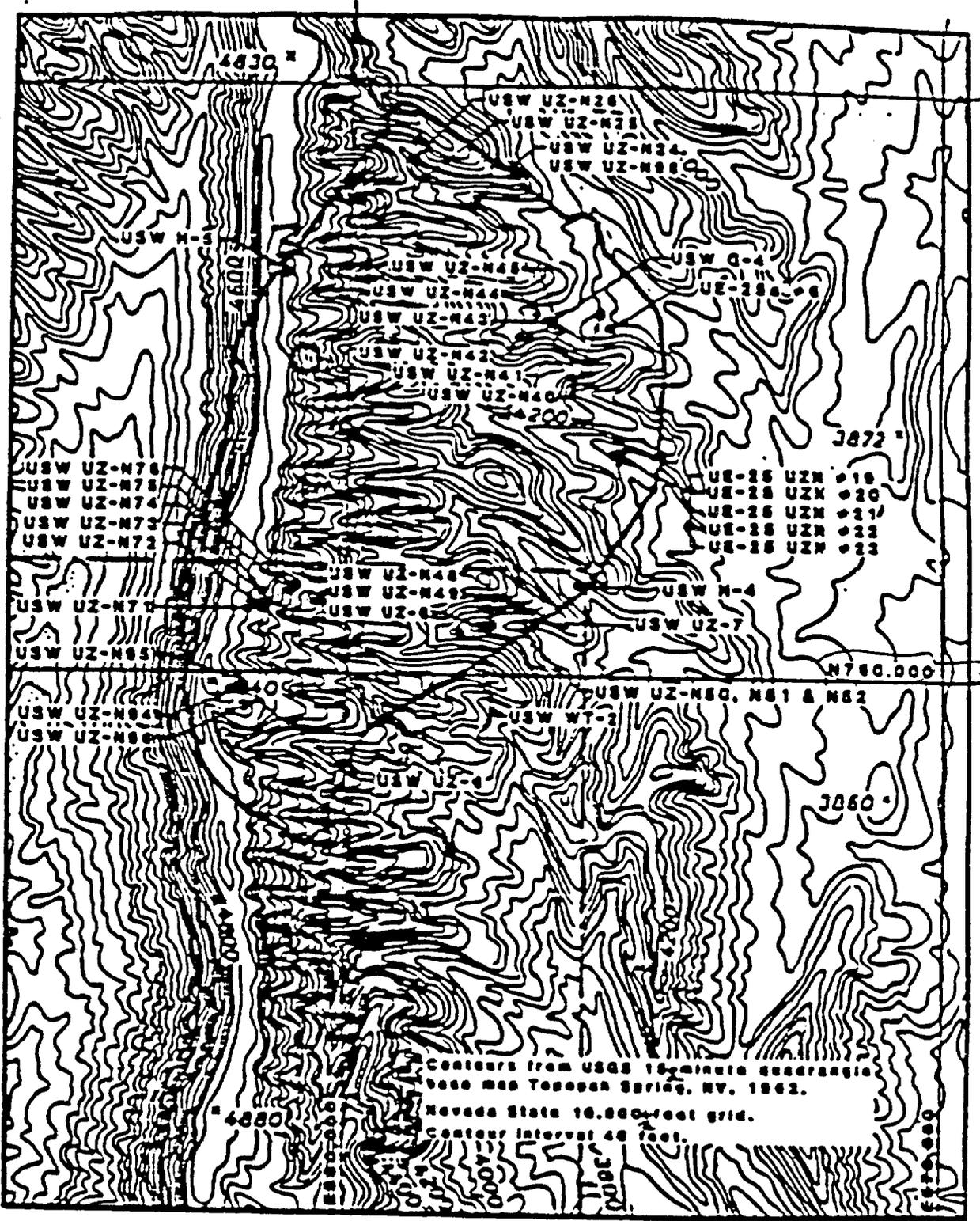


Figure 1. Drillholes located within the outline of the perimeter drift.

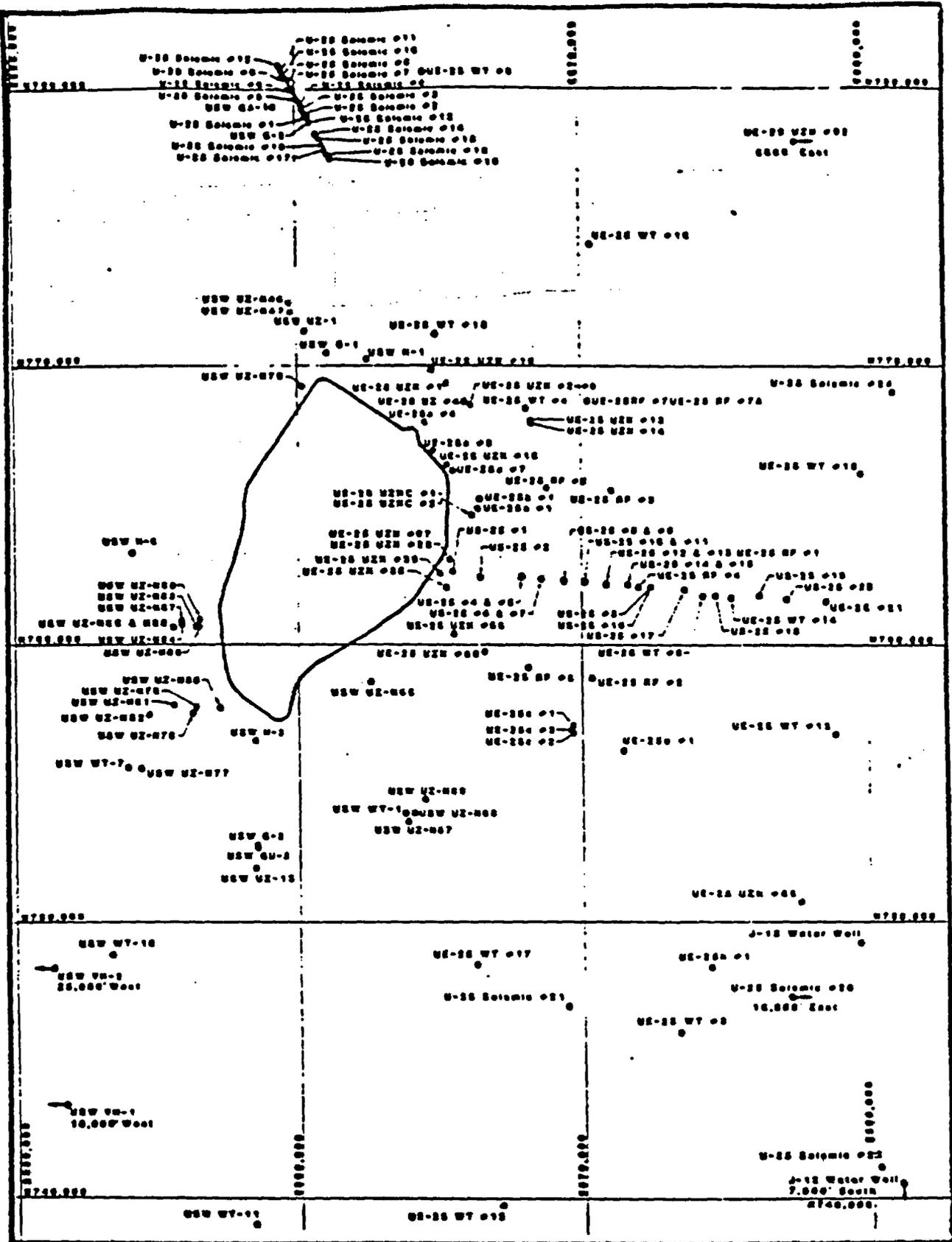
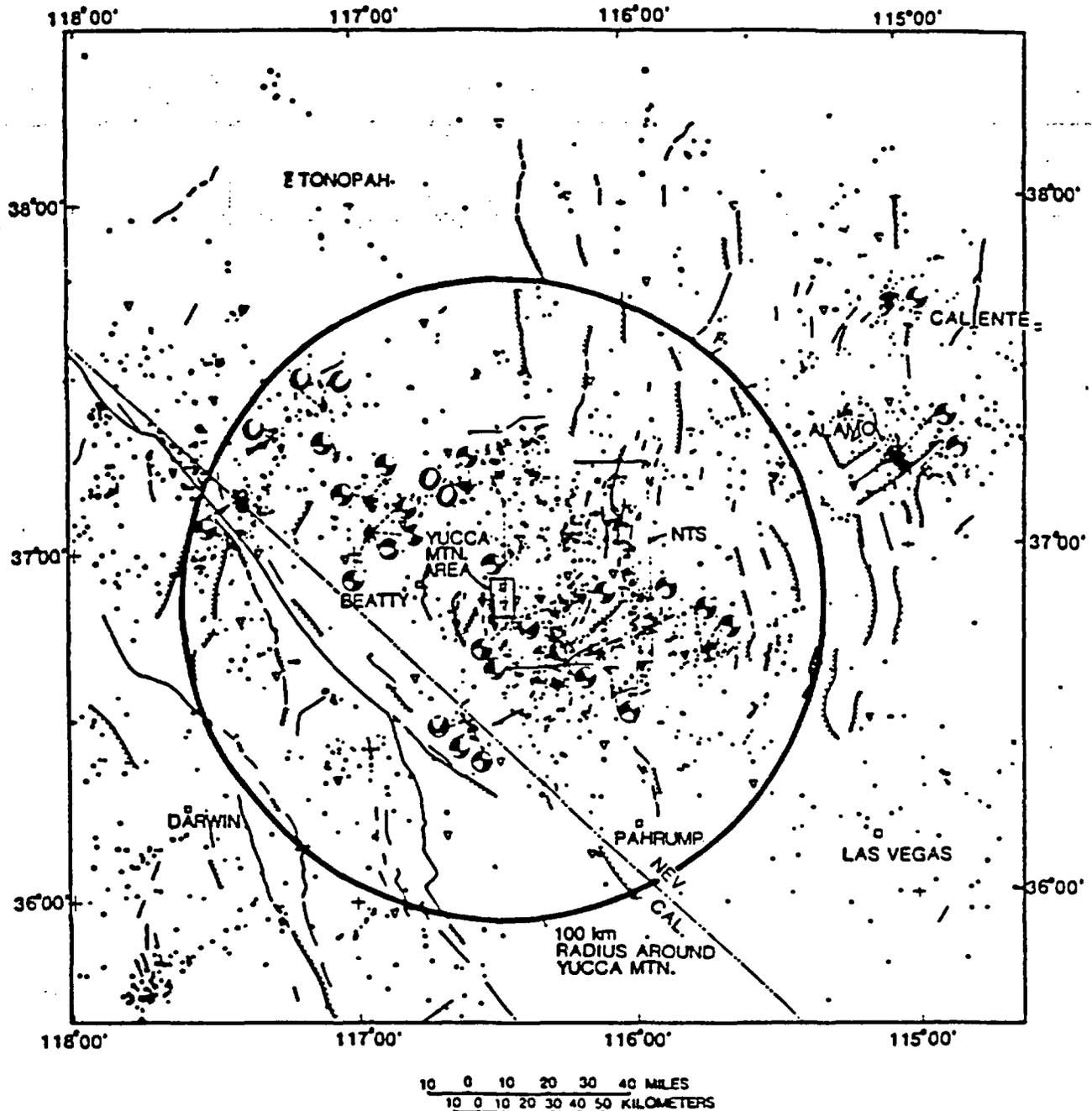


Figure 2. Drillholes located outside of the perimeter drift but within 10km of the perimeter drift.



ALL IMPORTANT QUATERNARY FAULTS ARE SHOWN OUT TO A 100 km RADIUS OF YUCCA MOUNTAIN MAP IS INCOMPLETE IN SOME AREAS BEYOND THAT CIRCLE.

UNUSUALLY LINEAR MTL. FRONT WHERE PERSISTENT FAULT ACTIVITY HAS MAINTAINED A PROMINENT SCARP IN BEDROCK. A STEEP LINEAR MTL. SEGMENT WHERE YOUNG DEPOSITS ARE NOT OBVIOUSLY OFFSET

FAULT KNOWN OR SUSPECTED TO HAVE HAD A SURFACE MOVEMENT IN LAST 2-3 MILLION YEARS

LINE OF VOLCANIC VENTS OF QUATERNARY AGE

SEISMOGRAPH STATION

SINGLE AND COMPOSITE FOCAL MECHANISMS LOWER HEMISPHERE PROJECTION OF THE FOCAL SPHERE WHERE SHADED AND UNSHADED QUADRANTS REPRESENT COMPRESSIONAL AND DILATIONAL FIRST MOTIONS RESPECTIVELY.

$0 \leq M_L < 1$ $2 \leq M_L < 3$

$1 \leq M_L < 2$ $3 \leq M_L$

Figure 3. Regional Map showing locations of the regional seismic network.

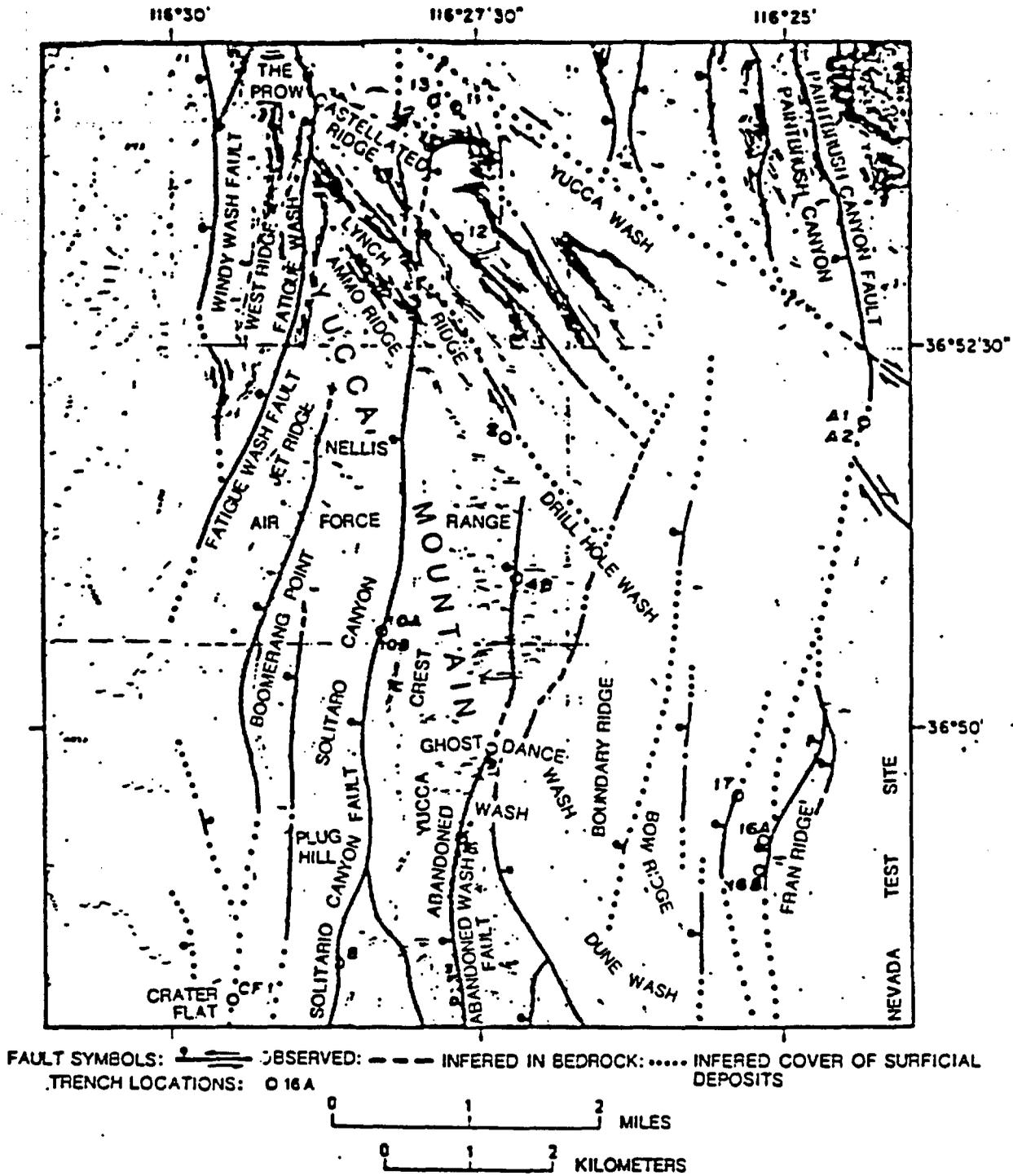


Figure 4. Trenches located along faults at Yucca Mountain interpreted from geologic mapping

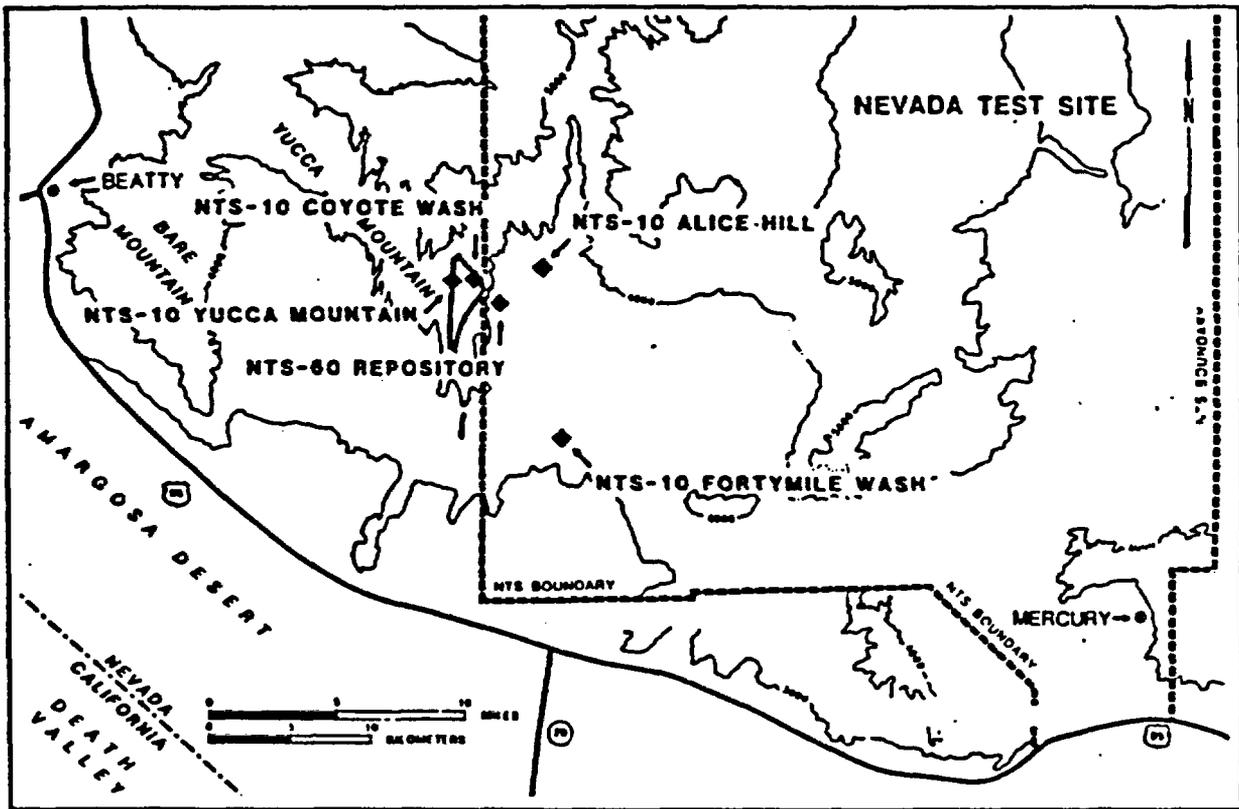


Figure 5. Meteorological monitoring sites

1-16-87

REVISED SCP CHAPTER 8 STRUCTURE *

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SCP Section #	Short Title	Issue or IN
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SCP Section #	Short Title	Issue or IN
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APPENDIX E

Environmental Requirements Imposed Upon Site Characterization and Repository Development by the Nuclear Waste Policy Act of 1982 and Associated Descriptions of the Environmental Requirements That Apply to Site Characterization and Repository Construction at the Yucca Mountain Site

Environmental Requirements Imposed Upon Site Characterization and Repository Development by the Nuclear Waste Policy Act of 1982 and Associated Descriptions of the Environmental Requirements That Apply to Site Characterization and Repository Construction at the Yucca Mountain Site.

1. Nuclear Waste Policy Act (NWPA).
 - a. Issue guidelines for recommendation of sites for repositories (Site Suitability Determination).
 - b. Prepare an environmental assessment (EA) for each site nominated for site characterization, evaluate site suitability using the guidelines, evaluate effects of site characterization on the environment, and assess impacts of repository development.
 - c. Conduct site characterization in a manner that minimizes environmental impacts identified in the site characterization plan (SCP).
 - d. Prepare an SCP for each site to be characterized, evaluate site suitability using the siting guidelines, and include plans for mitigating environmental impacts if the site is determined unsuitable for repository development.

- e. If the site is determined unsuitable for a repository, take reasonable and necessary steps to reclaim it and to mitigate environmental impacts caused by site characterization.
- f. For any site recommended for a repository, prepare an environmental impact statement (EIS) that is pursuant to compliance with the National Environmental Policy Act (NEPA) that addresses or reflects a site suitability determination consistent with the siting guidelines and that is not construed to amend or detract from licensing requirements of the Nuclear Regulatory Commission (NRC).

2. National Environmental Policy Act (NEPA).

- a. Mandated by NWSA.
- b. Applies only to repository development (construction, operation, closure, abandonment).
- c. NEPA sets forth a procedure for and requires environmental review and documentation.
- d. NEPA requires integration of analyses, studies, and surveys needed for complying with other environmental requirements.

3. Nuclear Regulatory Commission Rules for Disposal of High-Level Radioactive Wastes in Geologic Repositories.
 - a. Compliance is mandated by NWPA.
 - b. Applies only to repository development.
 - c. Requires an environmental report (ER) based on quantitative information and discussing environmental regulatory compliance.

4. Federal Land Policy Management Act (FLPMA).
 - a. Consult with U.S. Bureau of Land Management (BLM) on need for special use permit or land withdrawal where BLM land is involved, and proceed accordingly.
 - b. An environmental assessment (EA) could be required.

5. Materials Act.
 - a. If gravel or rock is to be extracted from BLM land, BLM approval must be obtained.
 - b. An extraction plan and environmental assessment may be required.

6. Floodplain and Wetlands Executive Orders.

- a. Publish notice of proposed action in Fed. Reg.
- b. Prepare floodplain/-wetlands assessment of any action in a floodplain/-wetland.
- c. Consult with U.S. Fish and Wildlife Service (FWS).
- d. Evaluate the practicability of the proposed floodplain/-wetlands action taking into account public comments.
- e. Evaluate practicable alternatives.
- f. Take into account mitigating measures and design the proposed action to minimize potential harm to the floodplain/wetlands.
- g. Publish statement of findings for floodplain/-wetland actions.

7. Endangered Species Act.

- a. Consult with U.S. FWS regarding probable occurrence of protected species in site vicinity.
- b. If necessary, conduct biological survey and assessment.
- c. Prepare mitigation plan if required.

8. National Historic Preservation Act (NHPA) and Related Statutes.
 - a. DOE must consult with the Nevada State Historic Preservation Officer (SHPO).
 - b. Archaeological surveys will be needed of areas to be disturbed.
 - c. If significant resources are discovered, avoidance or reclamation in accordance with the NHPA may be necessary.

9. American Indian Religious Freedom Act.
 - a. DOE must consult with the Bureau of Indian Affairs and any affected Native American tribal leaders.
 - b. If Native American sacred areas are discovered, alternative sites must be considered.

10. Noise Control Act.
 - a. DOE must monitor and abate environmental noise during project.

11. Clean Air Act.
 - a. See Nevada air quality statutes.

12. Solid Waste Disposal Act (SWDA).
 - a. See Nevada Solid Waste Management Statute.

13. Resources Conservation and Recovery Act (RCRA).
 - a. See Nevada Hazardous Waste Management System.

14. Clean Water Act.
 - a. See Nevada Pollutant Discharge Elimination System.
 - b. Designated State agency must approve plans for sewage treatment system, and State discharge regulations apply.

- c. If construction occurs in a stream bed, consult with the Corps of Engineers to determine requirements for a Section 404 dredge and fill permit.
- 15. Safe Drinking Water Act (SDWA).
 - a. Consult with U.S. EPA or designated State agency if any material is to be injected into potable ground water, including test well tracer injections.
 - b. Potable water supply must meet U.S. EPA Safe Drinking Water Standards and distribution system plans must be approved by designated State agency.
- 16. Protection and Propagation of Native Fauna; Miscellaneous Protection Measures.
 - a. A collector's permit from the Nevada Department of Wildlife is required to take native animals for purposes of study.
- 17. Unlawful Removal or Destruction of Flora.
 - a. A permit is required from the Nevada Division of Forestry to destroy native flora; all species of cacti are protected from removal or destruction.
- 18. Preservation of Prehistoric and Historic Sites.
 - a. A permit is required from the Nevada Department of Museums and History to study, collect, or excavate cultural resources.
- 19. Utility Environmental Protection Act.
 - a. Affects location and construction of electric, gas, telephone, telegraph, sewer, and water lines and facilities.
 - b. Controls land clearing, excavation, or potentially disruptive action to the environment.

- c. Permit to construct from the Nevada Public Service Commission requires location facility description summary of environmental studies made and other relevant information.
 - d. Application to be reviewed by PUC and by State Environmental Commission.
 - e. Public hearing may be required.
 - f. PUC must determine nature of probable environmental impact.
 - g. PUC must determine that facility conforms to State and local environmental requirements
20. Appropriation of Public Waters and Regulations for Drilling.
- a. Federal agencies must apply to the Nevada State Engineer for rights to use public waters.
 - b. A permit to appropriate well water will specify casing, appliance, repair and sealing requirements.
 - c. Water well drillers must be licensed and must keep logs and records.

21. Air Pollution.

- a. Allows for regulation of air contaminant sources via construction and operating permits from the Nevada Division of Environmental Protection.
- b. Adopts EPA standards for criteria pollutants and PSD.
- c. Operator of emitting facilities must register and report location, size, and height of source and process, fuels, nature, rate, and duration of emissions.
- d. Fees may be charged for processing permit.
- e. Allows for annual variances from applicable regulations.
- f. All government sources of air pollution must comply with State and local air quality laws, regulations, and ordinances.
- g. Potentially applies to boilers, incinerators, mining, cement plants, and other designate industrial processes.
- h. Federal PSD regulations also may apply to certain projects.
- i. An open burning permit also may be required if such activity is to occur.

22. Nevada Water Pollution Control Law.
- a. A discharge permit from the Nevada Division of Environmental Protection may be required for any discharges to the rock storage pile.
 - b. Package plants for sewage treatment must be permitted, and a permit also must be obtained for constructing any treatment works.
 - c. Public hearings may be required for permits.
 - d. An underground injection control (UIC) permit is required for injecting fluids into a well where water quality degradation may occur.
23. Public Water Systems.
- a. Specifications for potable water systems must be approved by the Nevada Health Division.
 - b. Potable water systems must comply with primary drinking water standards.
24. Collection and Disposal of Solid Waste.
- a. Plans for solid waste disposal must be reviewed by the Nevada Division of Environmental Protection.
 - b. A permit for solid waste disposal may be required.
25. Disposal of Hazardous Waste.
- a. Handling, storage, transportation, and disposal of designated hazardous wastes must not constitute a hazard to health, safety, and the environment.

- b. Designated materials such as some drilling wastes, spent oil and solvents must be registered with the Nevada Division of Environmental Protection and disposed of in an approved manner.
 - c. Disposal facilities for hazardous wastes must be permitted by NDEP.
- 26. Licensing of Radioactive Materials.
 - a. A license to use a radioactive source for well logging and for ground-water studies is required from the Nevada Bureau of Regulatory Health Services.
 - b. A licensee must allow State inspectors to inspect licensed operations.
- 27. Construction and Labor Camps and Food Establishments.
 - a. Allows for the Nevada Health Division to inspect sanitary conditions and food facilities where five or more persons are employed.
- 28. Uniform Plumbing Code.
 - a. New construction must conform to the National Uniform Plumbing Code.
- 29. Uniform Building Code and Fire Code.
 - a. New construction must conform to the National Uniform Building Code and the Nevada State Fire Marshall Code.
 - b. Construction cannot obstruct water flow in a floodplain.

APPENDIX F

Letter of May 13, 1987 from D.L. Vieth (DOE) to R.R. Loux (NWPO)
Responding to State of Nevada Comments on the EMMP for NNWSI



Department of Energy

Nevada Operations Office
P. O. Box 14100
Las Vegas, NV 89114-4100

RECEIVED

MAY 14 1987

NUCLEAR WASTE PROJECT OFFICE

MAY 13 1987

Robert R. Loux, Jr. Executive Director
Nuclear Waste Project Office
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Evergreen Center
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1802 North Carson Street
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ENVIRONMENTAL MONITORING AND MITIGATION PLAN (EMMP) COMMENTS

Thank you for your timely submittal of formal comments on the working draft of the EMMP as documented by your correspondence of February 23, 1987. We appreciate the efforts expended by the staff of the Nuclear Waste Project Office (NWPO) in producing a consolidated comment package from the comments you received from the various state and local agencies that participated. The comments will be incorporated in future versions of the EMMP to the extent that they contribute to the intent and purpose of the plan, namely to document compliance with Section 113(a) of the Nuclear Waste Policy Act (NWPA).

Those comments that were of a general nature were grouped by the NWPO into the following categories. Those categories along with responses to the subject comments are presented below.

"Absence of site-specific environmental data base"

Response: The Yucca Mountain Environmental Assessment (EA) establishes the pre-site characterization environmental baseline conditions. This baseline is derived from field studies in many technical areas, analogy or extrapolation in some areas, and expert judgement in other areas. This compilation is considered to be standard methodology used in preparing environmental assessments, and has historical precedents dating to the first implementation of the National Environmental Policy Act (NEPA).

NWPA requires that a NEPA Environmental Impact Statement (EIS) be prepared which addresses repository construction, operation, closure, and decommissioning. According to guidance from the Department of Energy (DOE), General Counsel, it is the intent of NWPA that this EIS consider "baseline" conditions to be those of the fully characterized site. A full environmental baseline will be included in the forthcoming EIS. That baseline will have been a subject of hearings and consultations with involved federal agencies, state and local agencies, and the public as required. The DOE policy position on this issue is documented in a letter from Ben C. Rusche, Director, to Governor Richard H. Bryan dated March 18, 1987 (enclosure 1).

MAY 13 1987

Robert R. Loux, Jr.

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"Incomplete Site Characterization Plan (SCP)"

Response: The SCP and the corresponding field study plans exist in draft form. The SCP is undergoing internal review and refinement prior to distribution to the states and tribes. A final SCP is not needed to begin the EMMP process, since the basic types of activities have been identified.

"Lack of a comprehensive and integrated environmental program"

Response: The EMMP and associated field studies are one component of a larger environmental program. That program covers the time period from selection as one of the sites to be characterized through the completion of the EIS process. The EMMP is a focused effort with a specific objective, independent of other environmental activities. This specific objective is the monitoring of those site characterization activities which are thought to have the potential for significant adverse environmental impact.

As you are aware, the working draft of the EMMP is an early version for use in open consultations with the states and affected parties. The Nevada Nuclear Waste Storage Investigations Project is eager to continue with an open and effective consultation process regarding the EMMP. We welcome the opportunity to meet and discuss your concerns at your convenience.



Donald L. Vieth, Director
Waste Management Project Office

WMPO:EVJ-1629

Enclosure:
As stated

cc w/encl:

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Washington, DC 20585

MAR 18 1987

INFO

Honorable Richard H. Bryan
Governor of Nevada
Carson City, Nevada 89710

Dear Governor Bryan:

Thank you for your letter of February 9, 1987, to Secretary Herrington regarding the current plans of the Department of Energy to collect site-specific environmental data from the Yucca Mountain site to determine the environmental impacts of site characterization activities.

Section 113(a) of the Nuclear Waste Policy Act of 1982 (the Act) requires the Department to conduct site characterization activities in a manner that minimizes any significant adverse environmental impacts. To ensure this, the Department prepared draft Environmental Monitoring and Mitigation Plans (EMMPs) which are currently under review by the States and Indian Tribes. As described in the EMMPs, site-specific environmental data will be collected before and during site characterization activities. This data will be used to monitor those aspects of the site that have the potential for experiencing significant impacts. Measures will be identified to avoid or minimize these impacts before they occur. If the site is found unsuitable, this data, along with that in the Environmental Assessments and information collected to comply with applicable regulatory requirements, will provide a sufficient basis for the Secretary under Section 113(c)(4) to take reasonable and necessary steps to reclaim the site and to mitigate any significant adverse environmental impacts caused by site characterization activities.

In addition, Section 114(f) of the Act requires the Department to prepare an Environmental Impact Statement (EIS) to accompany any recommendation to the President to approve a site for a repository. That EIS must consider as alternatives sites for which site characterization has been completed under Section 113 of the Act. The extensive site-specific environmental data which the Department will be collecting during the site characterization phase will serve as the basis for the development of this EIS.

Sincerely,


Ben C. Rusche, Director
Office of Civilian Radioactive
Waste Management