



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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MEMORANDUM

DATE: March 27, 1987

FOR: Robert E. Browning, Director
Division of Waste Management

FROM: Paul T. Prestholt, Sr. OR - NNWSI
PTP by new

SUBJECT: NNWSI Site Report for the Months of January, February
and March, 1987

I. QUALITY ASSURANCE

A. After the January 29, 1987, QACG meeting held here in Las Vegas, Jim Kennedy and I met briefly with Jim Knight and Carl Newton. We discussed the S.I.P. (Scientific Investigation Plan) problem that had grown out of NRC staff criticism of some QA level assignments. It was decided that Jim Kennedy and members of the NRC technical staff would meet with NNWSI QA and technical personnel to discuss the rationale for QA level assignments in

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general and the disputed level assignments in particular. The meeting was to be held under Appendix 7 rules and understandings.

The Appendix 7 meeting was called off. However, on February 11, Jim Kennedy and members of his staff met informally in my office with Jim Blalock, Stan Klein, and members of Mr. Klein's staff. The rationale for the level assignments, from the QA perspective, was explained and discussed. Since none of the technical staff were involved, a complete understanding of each organization's position was impossible. I believe that a formal meeting on this subject is still needed. The sooner a consensus on appropriate QA levels is achieved by all interested parties (including the State of Nevada), the better. A continued misunderstanding of this very basic QA issue can only result in an increased work load on the technical program in the future.

B. On February 13, I conducted a tour of the Test Site, including "G" tunnel, for Jim Kennedy and Linda Riddle. Jerry Szymanski, DOE-WMPO, represented the project. I believe these tours of the Yucca Mountain site are very important. It puts the issues into perspective for staff who, otherwise, would only be able to read about the site.

C. The stop work order status for the NNWSI is as follows:

USGS: The April 28, 1986, stop work order contained five conditions to resume work:

1. Proposed corrective actions and schedules for completion of audit findings approved by WMPO.
2. QAPP revised and approved by WMPO.
3. Indoctrination and training of personnel complete.
4. Plan to provide adequate QA coverage.

5. Assignment of QA levels completed and reviewed by WMPO.

STATUS:

1. Twenty of the 22 audit findings were accepted by WMPO. The remaining two are voided due to the transfer of the core facility operation to another participant (SAIC).
2. WMPO approved the USGS QAPP on October 27, 1986.
3. Indoctrination and training of USGS personnel on the USGS QAPP has been completed.
4. QA resource plan was submitted to WMPO on February 13, 1987. WMPO has completed its review; acceptance is anticipated.
5. Two (2) SIPs have been approved by WMPO. One (1) SIP is in the WMPO approval cycle. WMPO is awaiting formal submittal of thirty-five (35) SIPs.

- SAIC:**
1. QA levels associated with seventeen (17) tasks have been approved by WMPO. Work proceeds.
 2. Comments on QA levels associated with one (1) task are being resolved between WMPO and SAIC.

LOS

ALAMOS: Stop work order was rescinded November, 1986.

- LLNL:**
1. Five (5) SIPs have been approved by WMPO. Work proceeds.
 2. Five (5) SIPs remain which require submittal for WMPO approval.

SANDIA: SNL stop work order was rescinded December, 1986.

(The above contained in a handout from the March TPO meeting, enclosed)

D. During the week of March 30, 1987, an NNWSI audit of Los Alamos National Laboratory will be conducted. Paul Bemba (WMGT) and I will attend as observers. Jim Kennedy (WMP) has asked that we concentrate on the following:

1. Organization charts and rosters of LANL personnel working on the NNWSI.
2. Report on status of work (mineralogy/petrology) at LANL, i.e., what lab work is being done in the min/pet area.
3. Develop suggestions for possible audit areas for the up-coming NRC mini-audit of the LANL min/pet program.

II. GEOLOGY-HYDROLOGY

A. During the March 25 TPO-Project Manager meeting, Dr. Bruce Crowe, LANL, presented the results of recent work on dating the volcanic activity at the Lathrop Wells volcanic center. This volcanic center consists of a basaltic lava field and a scoria cone. The scoria cone is located just off highway 95 at the south-east tip of Yucca Mountain.

Recent work by Dr. Crowe and B. Turrin (USGS) along with University of New Mexico, SAIC, and WMPD personnel indicate that there were multiple eruptive events separated by a significant time gap. The investigation suggests that the lavas were erupted from a north-northwest trending fissure system and not from the scoria cone. The age of the lava flow is estimated at 150,000 y.b.p. (years before present), while the scoria cone is much younger and may, in fact, be younger than 20,000 y.b.p.

The lines of evidence for a $\pm 20,000$ year age for the scoria cone are:

1. Cone degradation parameters
 - Consistent with an age of less than 20,000 years
 - Best match, 15,000 year old cone, Cima volcanic field.
2. Soil development
 - Analysis not completed
 - Profiles consistent with age of less than 20,000 years
3. Desert varnish
 - Not calibrated for cone
 - Angular, Ti-Cr bearing magnetite crystals found at top of varnish, in some cases, protruding from varnish surface
 - Suggestive of recent eruption
 - Position of crystals in varnish consistent with young age
4. - Carbon-fourteen age of $19,900 \pm 300$ carbon years of bomb collected near top of cone
 - Technique not well established
5. Conclusions:
 - Age and detailed chronology not resolved
 - Current data are consistent with an age of 20,000 years
 - Problem must be carefully evaluated for risk assessment

The enclosed handout should be carefully studied by the technical staff. The two areas that are immediately impacted are:

1. The ash found in trenches - since the soil cover has been dated at older than 20,000 years, it may be concluded that the trench ash comes from the much older Crater Flat volcanic centers (Red and Black Cone).

2. Anticipated - unanticipated events - does a 20,000 year date for volcanic activity now make such activity anticipated per 10 CFR 60?

B. A document dated March 13, 1987, and titled "NNWSI Project Summary of Ongoing and Planned Site Characterization Activities for the Candidate Site at Yucca Mountain, Nevada" was sent to the State of Nevada by OCRWM. There is no indication on the document that it was also sent to the NRC. Included in this document are "Ongoing Site Characterization Activities: Description and Rationale" and "Planned Site Characterization Activities." The document is attached, however, I am reproducing each section as it pertains to NRC technical activities.

o 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 on going.

- 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.

- 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.
- 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 SCP.
- 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.
- 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.

- 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.
- 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.
- A mining company is drilling boreholes in the Amargosa Desert as part of its exploration programs. This commercial company has 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.

- 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.
- 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.
- 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.

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.

- 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.

- 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.

- 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.

- 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.
- 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.
- 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.

C. During the week of February 23, a field trip consisting of NRC WMGMT staff representing geology, seismology, geophysics, geochemistry and hydrology, was held. The State of Nevada sent a number of UNR faculty and graduate students. The group visited the Test Site, areas of interest near Beatty, NV, and Tonopah, NV, and the site of a 1932 earthquake near the Cedar Mountains.

Dr. John Bell, UNR, is investigating the Cedar Mountain fault system and acted as leader of this portion of the trip. Charlotte Abrams, WMGT, was the overall triplleader and is preparing a comprehensive report. Mr. Ernie Hardin, SAIC, went along and is preparing a report for WMPO. I will be given a copy of Mr. Hardin's report and will forward it.

I believe the trip was a success even though we weren't able to have USGS participation. The NRC staff from different technical disciplines participated in this type of activity, I believe, for the first time. This trip should afford the staff a good perspective for the SCP review.

III. GEOCHEMISTRY

From the report mentioned in II:

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.

- o 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 going 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 vary 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.

o 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, and 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.

- 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.

- 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.

- 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.

- 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.

- 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.

IV. ROCK MECHANICS, FACILITY DESIGN and EXPLORATORY SHAFT

A. On April 14, a meeting will be held in Las Vegas to present to the NRC and the State of Nevada proposed changes to

the Exploratory Shaft Facility (ESF). As I've reported previously, WMPD plans an expanded test facility and more than 5000 feet of drifts, in lieu of horizontal drill holes, to examine the Ghost Dance fault, drill hole wash and the imbricate normal fault zone east of the repository. Attached is a background paper explaining the proposed facility.

B. From the document mentioned in II:

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 of 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 prediction 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.

V. WASTE PACKAGE

Nothing to report

VI. PERFORMANCE ASSESSMENT-ALLOCATION

Nothing to report

VII. ENVIRONMENT

Nothing to report

VIII. LICENSING and NRC-DOE INTERACTIONS

A. A team from WMEG spent two weeks (February 23 to March 5) reviewing the Conceptual Design Report (CDR) for the underground and surface facilities. On March 6, Dr. Dinesh Gupta led the NRC staff in an Appendix 7 meeting with SNL staff in

Albuquerque, NM. I was not present for this meeting but both parties report that it was very successful.

B. Enclosed is a list of DOE-NRC meetings as understood by WMPO.

IX. STATE INTERACTIONS

A. The Nevada State Commission on Nuclear Projects met on February 6. The agenda is enclosed.

B. A copy of the remarks of Mr. Grant Sawyer, Commission Chairman, that were delivered on December 9, 1986, is enclosed.

C. The minutes of the November 24, 1986, Nevada Legislature's Committee on H.L. Radioactive Waste is enclosed.

X. MISCELLANEOUS

A. SCP - status

The enclosed handout from the 3-25-87 TPO meeting is self-explanatory. The present "Best Date" of publication is the end of August, 1987.

B. Study Plans

o At present, NNWSI will write 35 study plans. This total will probably increase.

o Approximately 29 are planned to be issued with the SCP. Six will be issued at a later date.

o A list of the proposed NNWSI study plans is enclosed.

o A list of the BWIP study plans is enclosed.

C. The agendas for the January, February, and March TPO meetings are enclosed.

D. The NRC staff comments on the final EA are being incorporated into the SCP. A group of SAIC staff are working through the SCP text to assure that each NRC EA comment has been addressed.

PTP:nan

cc: With enclosures:

J. J. Linehan, K. Stablein, S. Wastler

cc: No enclosures:

D. L. Vieth	D. M. Kunihero	F. R. Cook
J. P. Knight	L. Kovach	J. K. Goodmiller
R. R. Loux	G. Cook	J. J. K. Daemen
J. Szymanski	N. Still	R. Johnson
M. Glora	C. Abrams	

Enclosures:

Proposed Changes to the Nevada Nuclear Waste Storage Investigations Project Exploratory Shaft Facility, 3/87; Nevada Nuclear Waste Storage Investigations Project Summary of Ongoing and Planned Site Characterization Activities for the Candidate Site at Yucca Mountain, Nevada 5/86-4/87; Stop Work Order Status; Volcanism Presentation, TPO Meeting 3/25/87; Minutes of the Meeting of the Nevada Legislature's Committee on High-Level Radioactive Waste, 11/24/86; Agenda, Nevada Commission on Nuclear Projects Meeting, 2/6/87; Remarks of Grant Sawyer, 12/9/86; Schedule of Meetings between NRC & DOE; Summary of the NRC/DOE Meeting on SCP Issues Hierarchy/Performance Allocation; TPO/PM Meeting 3/26/87, Study Plan; BWIP SCP Section 8.3 Investigations/Study Plans, 3/13/87; Geology, Geophysics, and Geoengineering; SCP Status Report, 3/25/87; 3 Agendas, NNWSI Project Manager-Technical Project Officer Meeting; Quality Leadership and Change by Rosabeth Moss Kanter