

Chapter Two

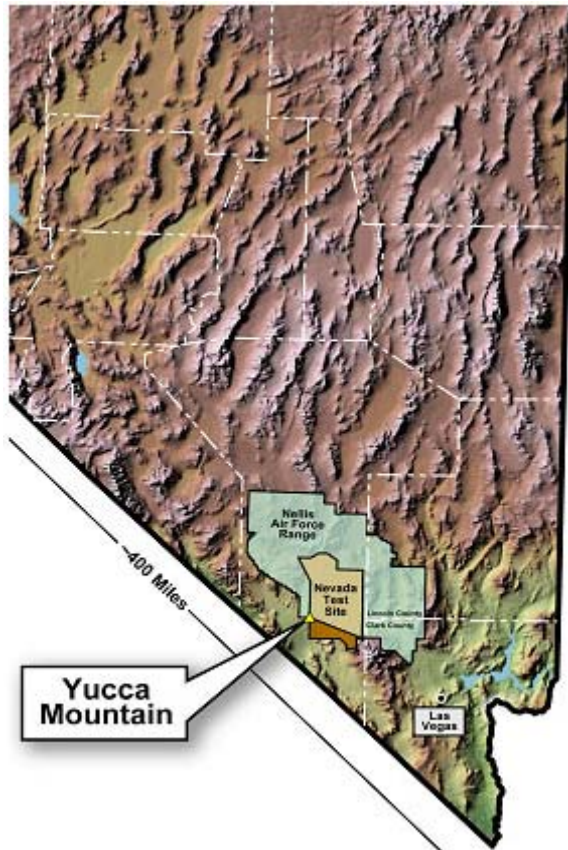
Yucca Mountain Site Characterization Project

Background

During FY 2001, the Yucca Mountain Site Characterization Project was responsible for investigating the suitability of the Yucca Mountain site, 100 miles northwest of Las Vegas, Nevada, for a geologic repository for spent nuclear fuel and high-level radioactive waste and developing designs for a potential repository. If a repository is developed there, the

Office of Civilian Radioactive Waste Management (OCRWM) will accept spent nuclear fuel and high-level radioactive waste from the sites where it is currently stored, transport it to Yucca Mountain, and emplace it in the repository. The Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) have published regulations governing the repository.

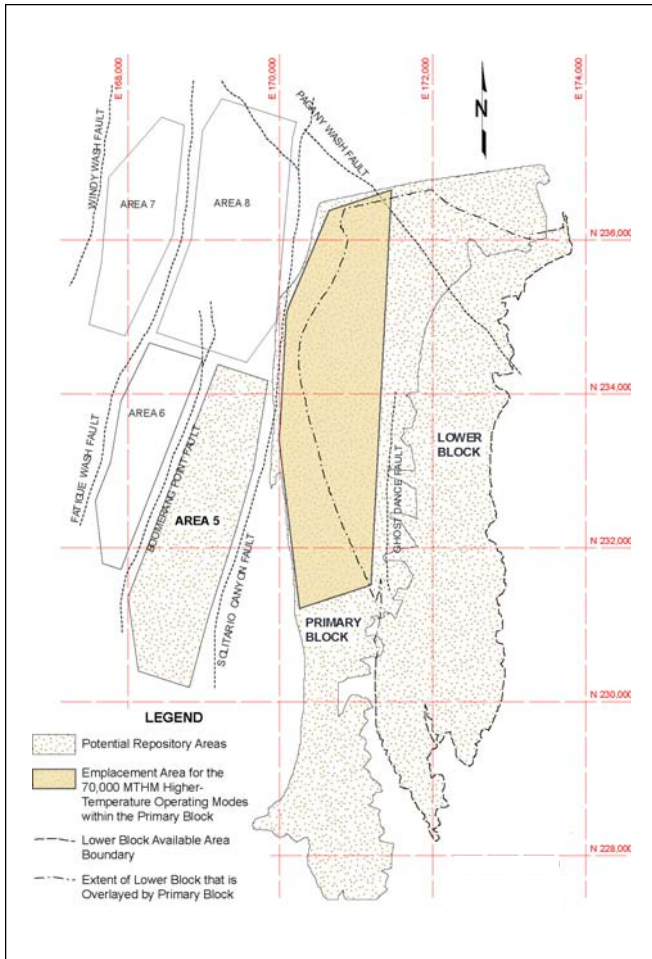
Early in FY 2002, all of the investigations necessary to provide an adequate technical basis for a decision on site recommendation were completed. However, site evaluation and the repository design are ongoing processes and, even now that Yucca Mountain is designated as the repository site, confirmatory testing and monitoring activities are expected to continue until repository closure. New information will be evaluated for its effect on system and subsystem performance as part of an ongoing learning process. Design and operating decisions will be modified based on feedback from these evaluations, as well as other technological and policy developments. The ongoing learning process is designed to challenge models and assumptions and lead to continuous improvement.



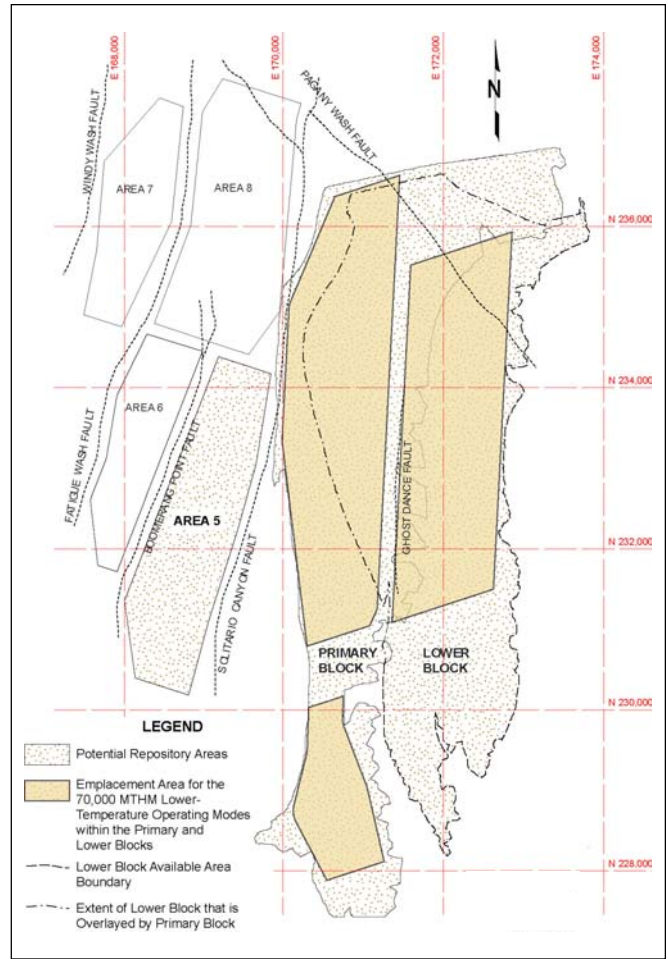
Location of Yucca Mountain within the State of Nevada

Funding

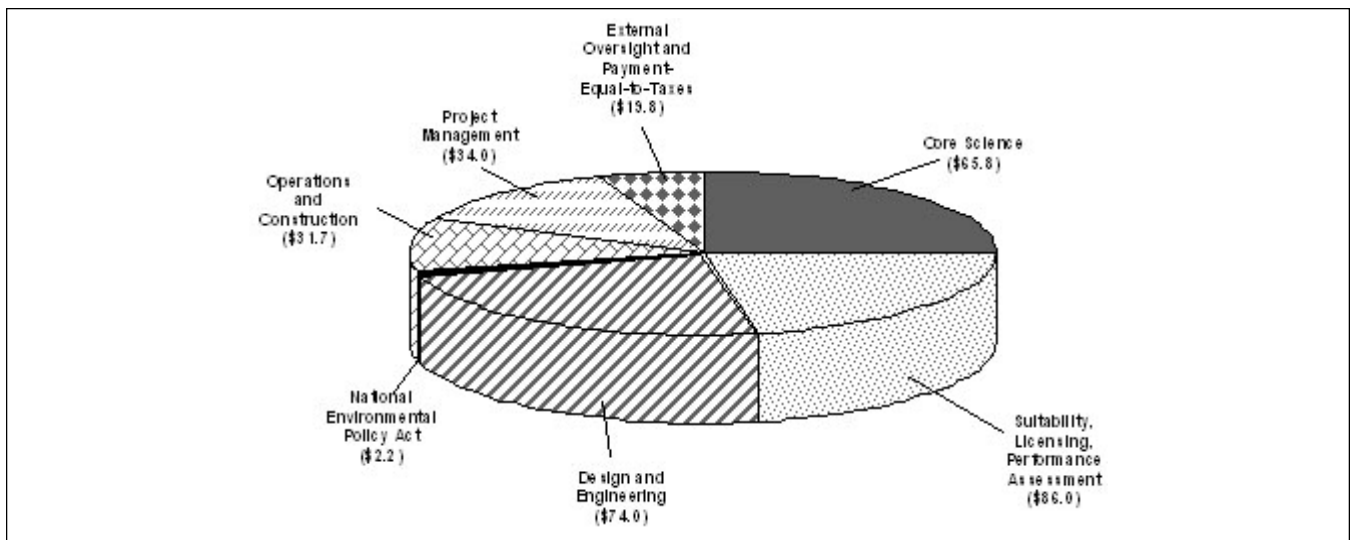
To accomplish the work planned for Fiscal Year 2001, OCRWM allocated \$313.5 million of its appropriation of \$390.4 million to the Yucca Mountain Site Characterization Project. The distribution was as follows: \$65.8 million was allocated to core science; \$86.0 million to site suitability, licensing, and performance assessment; \$74.0 million to design and engineering; \$2.2 million to National Environmental Policy Act compliance; \$31.7 million to operations and construction; \$34.0 million to project management; and



Potential repository areas and emplacement area for the higher-temperature operating mode



Potential repository areas and emplacement area for the lower-temperature operating mode



Fiscal Year 2001
Yucca Mountain Project Budget
(dollars in millions)

\$19.8 million to external oversight and payments-equal-to-taxes (PETT).

Major Fiscal Year 2001 Activities and Results

The Yucca Mountain Site Characterization Project was directly responsible for meeting three of the Program's four performance targets in the Department's Annual Performance Plan for Fiscal Year 2001 and contributed to accomplishment of the fourth. All four of the performance targets were related to the site recommendation.

Performance Target #1: Complete the scientific and technical documents that will provide the technical basis for a possible site recommendation

During Fiscal Year 2001, the Project prepared the following documents to help inform decision makers, regulators, and the public about the scientific and engineering aspects of a potential repository:

- *Yucca Mountain Science and Engineering Report* (S&ER, May 2001), which documents the science and engineering knowledge that accumulated on the suitability of the site during the last two decades. It describes a design which can be operated in a range of thermal environments and which is represented by two examples of operating modes: above boiling (defined as a heat loading of 1.45 kW/m on a line of emplaced canisters) and below boiling (<85 degrees Celsius average maximum waste package surface temperature).
- *Supplement to the Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (SDEIS, May 2001). As anticipated in the 1999 Draft Environmental Impact Statement (DEIS), design enhancements of the repository continued to evolve as the Program evaluated ways to improve long-term performance of the

potential repository at Yucca Mountain. To update the DEIS with the most recent information on the design, the SDEIS describes the potential environmental impacts that could occur, based on the design and range of possible operating modes, and compares these impacts to the impacts presented in the DEIS.

- *Preliminary Site Suitability Evaluation* (PSSE, August 2001), which provides a preliminary evaluation of the site's performance against the Department of Energy's (DOE) proposed site suitability guidelines. The preliminary evaluation described in the PSSE is based on information contained in the S&ER, supplemented by more recently available technical information.

Performance Target #2: Conduct statutory hearings in the vicinity of Yucca Mountain to inform the residents that the site is under consideration and to receive comments regarding a possible site recommendation

The Project conducted 66 hearings at locations across Nevada and in Inyo County, California, to inform residents and to receive their comments regarding the Secretary's consideration of whether to recommend Yucca Mountain as a site for a nuclear waste repository. Public hearings on the documents released on the consideration of Yucca Mountain as a site for a geologic repository provided major opportunities for formal public involvement. One series of public hearings was held for the SDEIS in May and June 2001 in Amargosa Valley, Las Vegas, and Pahrump, Nevada. A separate series of public hearings, supporting the site recommendation consideration process and tied to the public comment period that began in May, spanned September and October 2001. A supplemental public comment period was opened from November 14 to December 14, 2001. Comments received at the hearings and through other public comment channels (e.g., U.S. mail) were categorized and were addressed in a Comment Summary Document.

Performance Target #3: Update all process models and conduct a total system performance assessment for use in the site recommendation

In Fiscal Year 2001, OCRWM completed the refinement of models used to examine the natural system to reflect new information from site investigations and laboratory studies, advances in modeling physical processes at the site, and an enhanced repository design. OCRWM published several reports during the year that reflected evolving information and its impact on expected repository performance. These include:

- *Total System Performance Assessment for the Site Recommendation Rev 00 ICN 01* (TSPA-SR, December 2000), which documents a probabilistic performance assessment of the Yucca Mountain repository. It is based on the Analysis and Model Reports that the Project developed in Fiscal Year 2000 and is essentially the culmination of all previous Project work.
- *Fiscal Year 2001 Supplemental Science and Performance Analyses, Volume 1 and Volume 2* (SSPA, July 2001), which updated the TSPA and addressed the potential effects of uncertainties that previously had not been quantified in the performance assessment to give further insight into the possible behavior of the repository. It also included new models and data produced since the Analysis and Model Reports were completed. One major hypothetical change was the inclusion of early waste package failures in the analysis.
- *Total System Performance Assessment – Analyses for Disposal of Commercial and DOE Waste Inventories at Yucca Mountain – Input to Final*

Environmental Impact Statement and Site Suitability Evaluation (FEIS/SSE Letter Report, September 2001), which updated the performance assessment analyses to conform to the specific requirements in EPA’s final radiation standard.

Performance Target #4: Complete and issue Total System Life Cycle Cost and Fee Adequacy reports

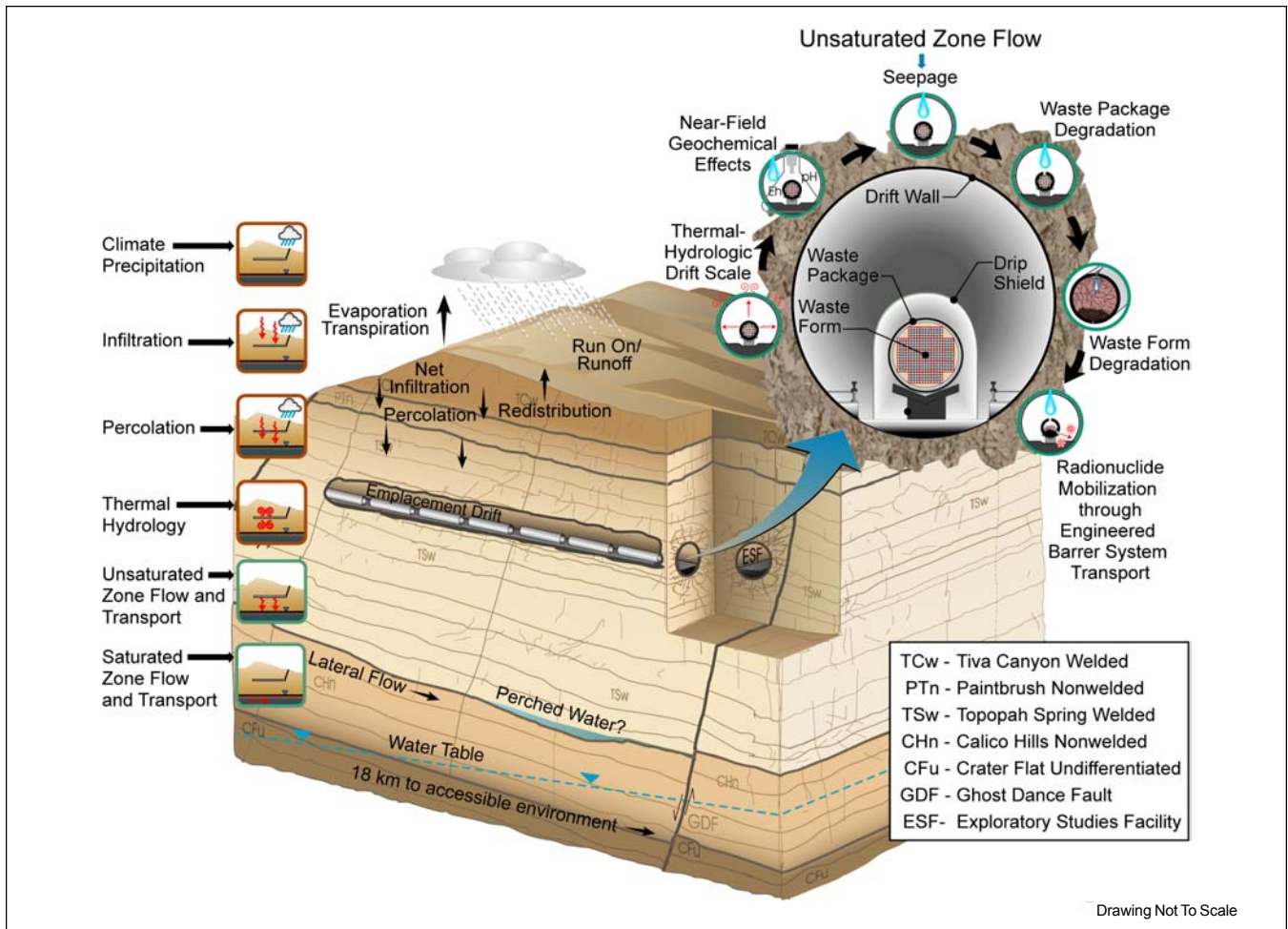
The Project contributed design, planning, cost and schedule data, and analysis to this effort. The reports were issued in May 2001.

Scientific and Engineering Accomplishments

Scientific and engineering studies conducted during Fiscal Year 2001 contributed to reducing uncertainty about the effectiveness of a potential repository at Yucca Mountain in isolating radioactive waste. Progress was made in characterizing the details of groundwater movement, the effects of heat on the physical and chemical properties of the repository host rock, the performance of engineered components (e.g., waste containers) of the repository system,



Heater element installation for thermal testing in the cross drift, April 2001



Conceptual illustration of physical processes modeled in the total system performance assessment of a potential Yucca Mountain disposal system

incorporating this scientific and engineering data into site performance models, and identifying and documenting the remaining uncertainties in the models. Results of these studies supported the Secretary's site recommendation decision.

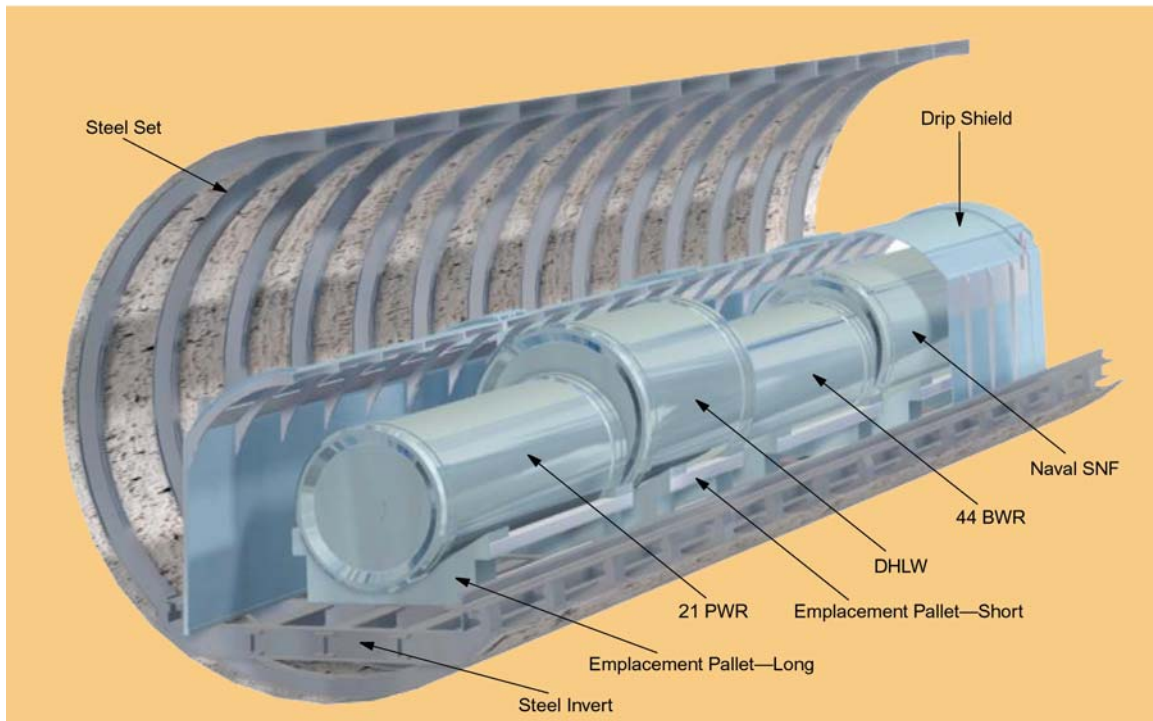
Scientific investigations update

During Fiscal Year 2001, we continued to conduct site investigations at test facilities at the Yucca Mountain site and in its vicinity and at several off-site laboratories. Our facilities include nearly 11 kilometers (7 miles) of tunnels in the Exploratory Studies Facility and cross-drift, dozens of surface sites, and hundreds of boreholes. The facilities are used to study the natural features of the site, water and chemical movement

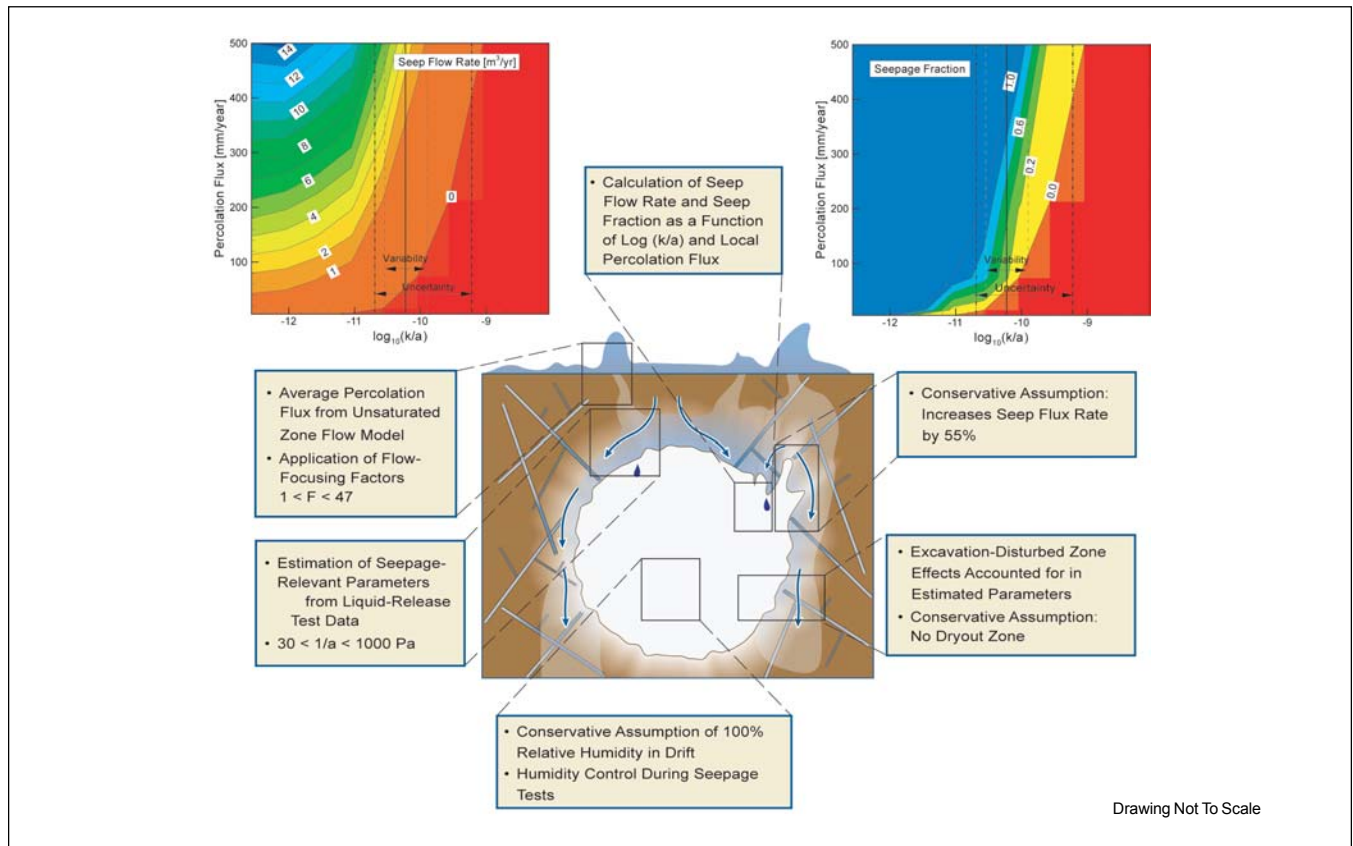
through the rock, and the effects of heat and water on the physical and chemical properties of the rock. In addition, many rock and water samples have been sent to off-site laboratories for testing. The results of our scientific studies are used to develop engineering designs that will be effective in containing waste and as input to performance assessment models that help identify areas of uncertainty and areas where design enhancements will be most beneficial.

Key scientific studies of Fiscal Year 2001 and their results include:

- **Drift seepage** – Capillary attraction tends to hold water in the rock matrix and prevent it from dripping from the roof or walls of drifts (tunnels) until a high enough saturation is



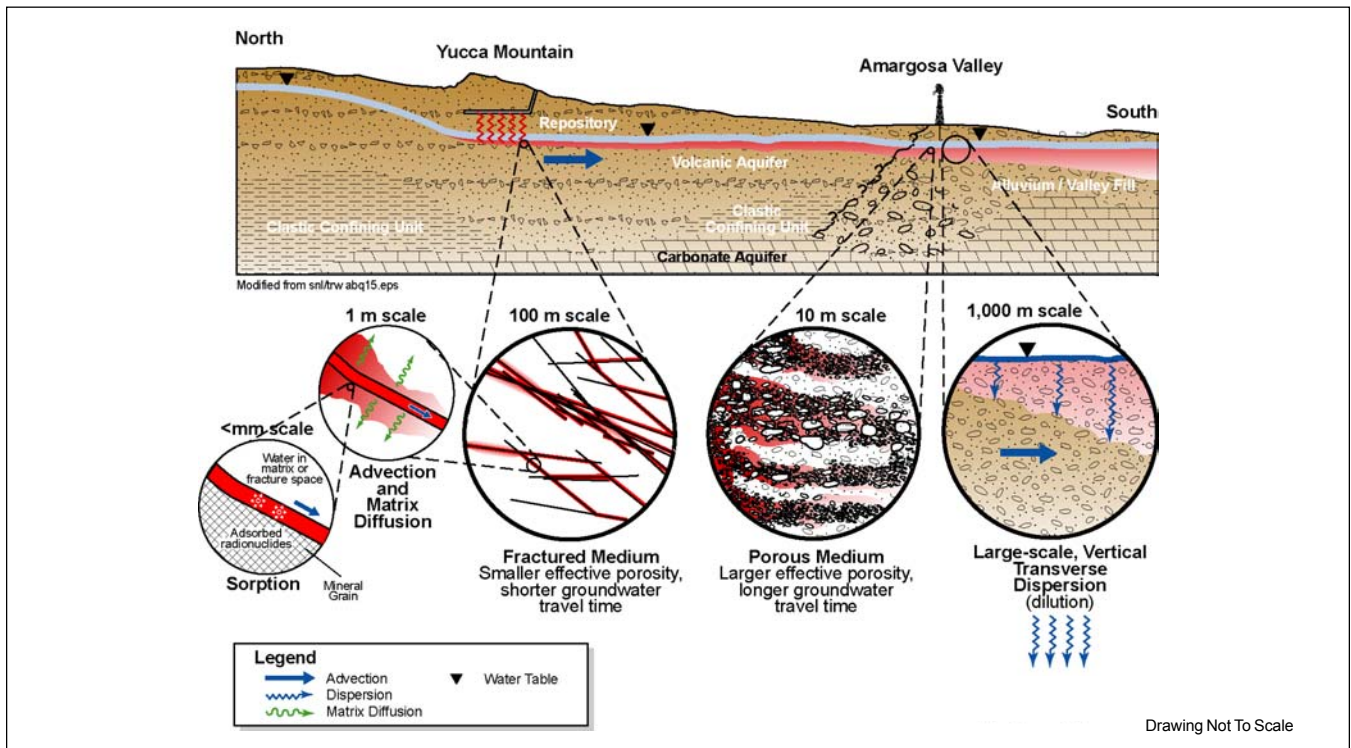
Typical section of emplacement drift with waste packages and drip shields in place



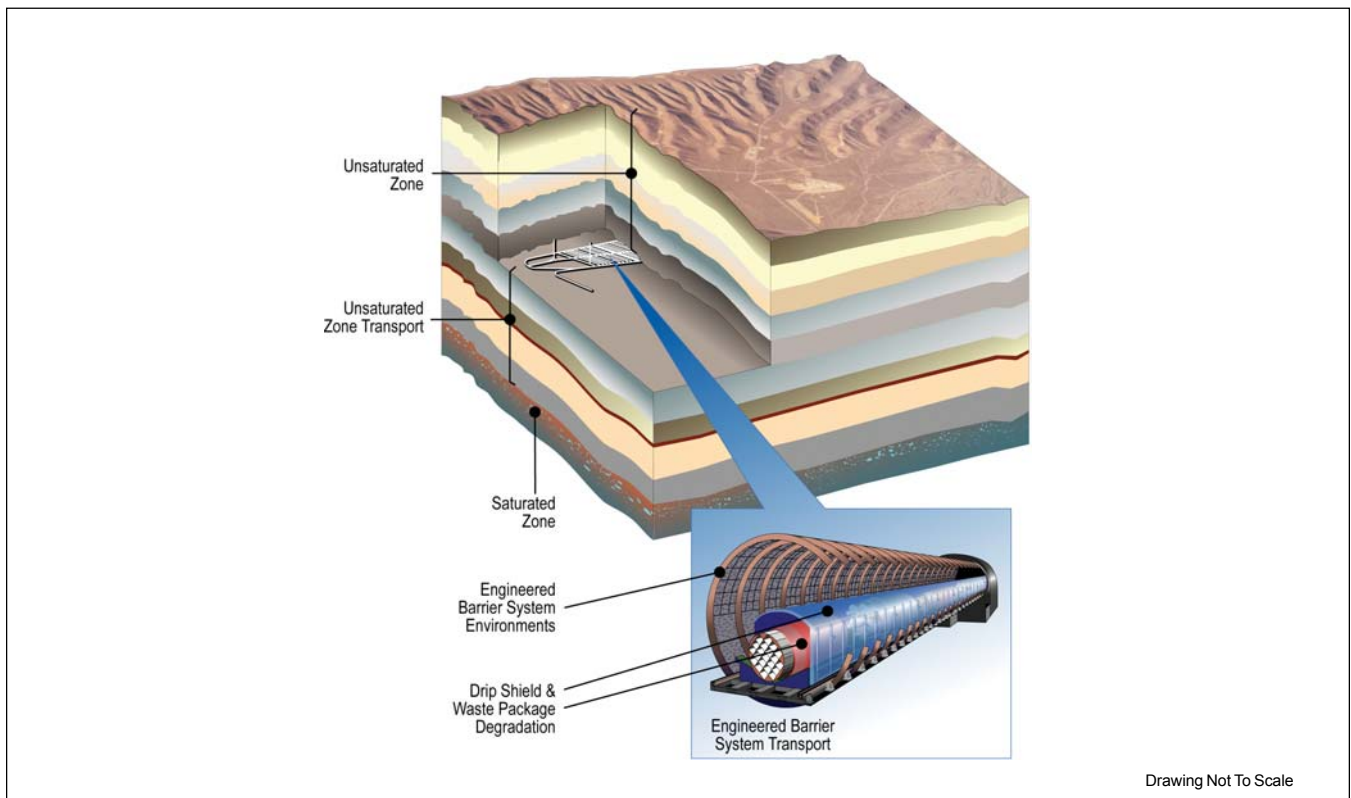
Summary of results from seepage testing and modeling

reached. We conducted measurements under ambient and induced flow conditions to assess the effects on seepage of the excavation-disturbed zone, drift geometry, and surface roughness. Under ambient conditions, seepage is virtually nonexistent – the one location at which it was observed may have been affected by nearby maintenance activities. Testing under induced conditions, e.g., where water is applied to a surface above the measurement site, indicates that percolation flux would have to be orders of magnitude higher than current natural rates to initiate seepage. In principle, seepage would only be observed under specific conditions, such as where the average percolation flux from a large area became concentrated into only a few flow paths — a situation known as “flow focusing.” Other tests during previous years demonstrate that, even in regions with pervasive fracturing associated with through-going faults, seepage into excavated underground openings under present-day percolation fluxes is not expected.

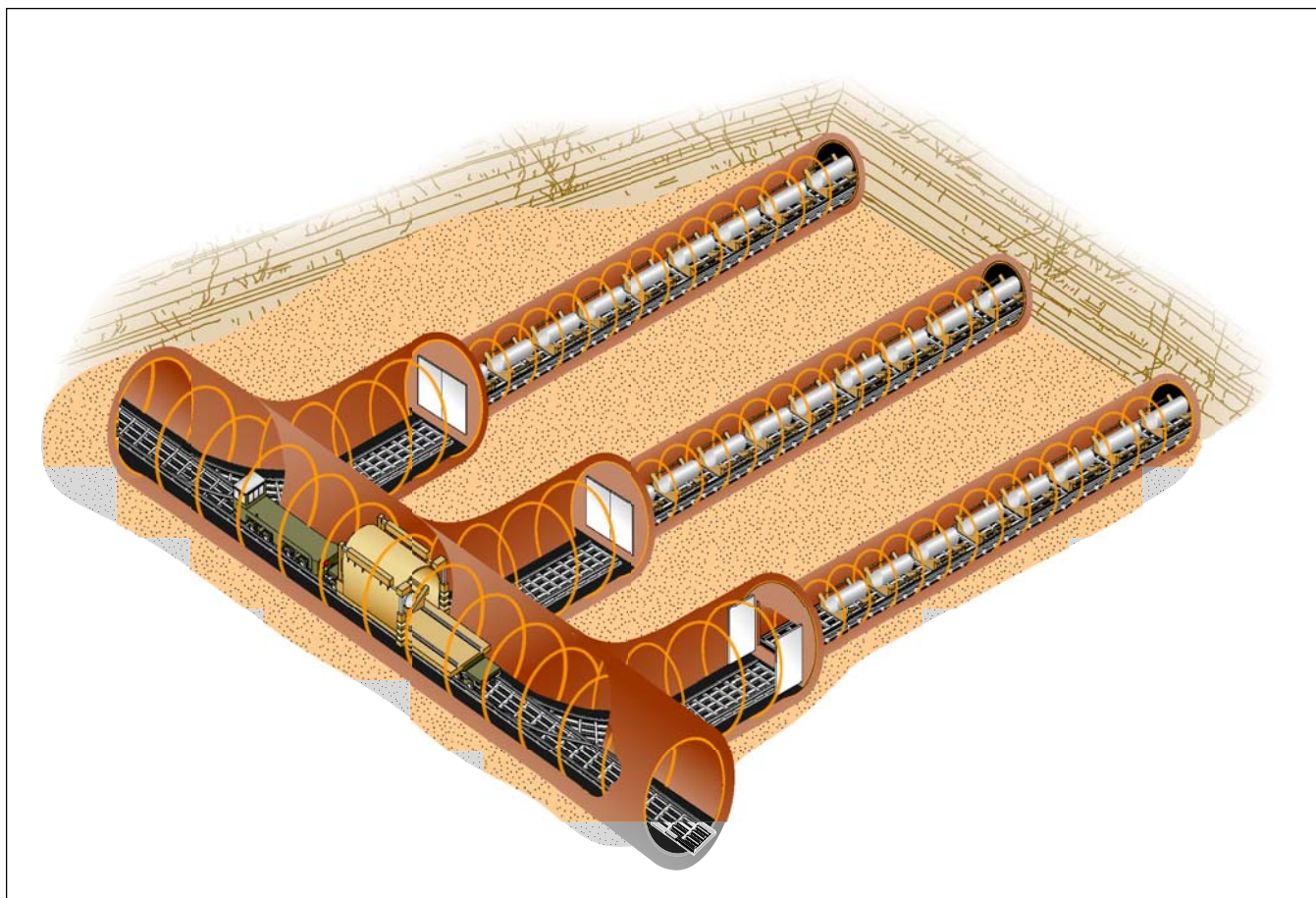
- **Nye County Drilling Program** – We continued to integrate our efforts with Nye County and its Early Warning Drilling Program, which is being conducted with funding from OCRWM. During Fiscal Year 2001, project scientists assisted county scientists as they began drilling a third series of boreholes. Stratigraphic data and information from rock and groundwater samples collected during and after drilling has been integrated into our conceptual model of the saturated zone and our site-scale model. Further information on the Early Warning Drilling Program can be found on Nye County’s web site: www.nyecounty.com/ewdpmain.htm.
- **Colloid Transport** - In Fiscal Year 2001, we completed single-well and began multi-well hydraulic and tracer testing at the alluvial testing complex in an effort to better understand flow and radionuclide transport through the alluvial portion of the aquifer. The data from the initial single-well test provided information for colloid and radionuclide transport models prepared for the site recommendation. The multi-well tracer test will provide validation of the single-well test results and facilitate the calculation of more complex transport parameters not obtainable from the single-well tests.
- **Unsaturated and Saturated-Zone Radionuclide Transport Tests in Large Blocks** – In Fiscal Year 2001, we began tracer injection tests in two 1-cubic meter blocks excavated from the Busted Butte fault. The tests are being conducted by Atomic Energy of Canada, Limited. The results thus far support the transport behavior of radionuclides observed under a much smaller, laboratory-scale as well as the site-scale measurements in the C-Wells.
- **Heat Effects** - In Fiscal Year 2001, altered rock samples were collected at the drift scale heater test and the mineral alteration was characterized. These results have been utilized to validate models of coupled thermal-hydrochemical processes. In the drift scale test, approximately 15,000 cubic meters (about 19,600 cubic yards) of rock was heated for four years to simulate heat from actual canisters of spent nuclear fuel. A four-year cooling cycle began in Fiscal Year 2002.
- **Seismic Testing** - During the summer of 2001, engineers used equipment to generate seismic surface waves along more than 30 lines located at the crest of Yucca Mountain and recorded the effects. This experiment enabled us to determine how shear-wave velocity varies with depth and how this depth dependence varies spatially. The shear-wave velocity information will be used in calculations of seismic ground motion at the surface of the mountain for seismic design considerations.
- **Groundwater Modeling** - In Fiscal Year 2001, scientists completed all work on the final steady-state, pre-development, Death Valley Regional Flow System model. A draft report on the model was completed and submitted for



Schematic illustration of different transport processes



Natural and engineered barriers would work together to protect the environment



The repository would be a series of drifts where waste packages would be emplaced and monitored

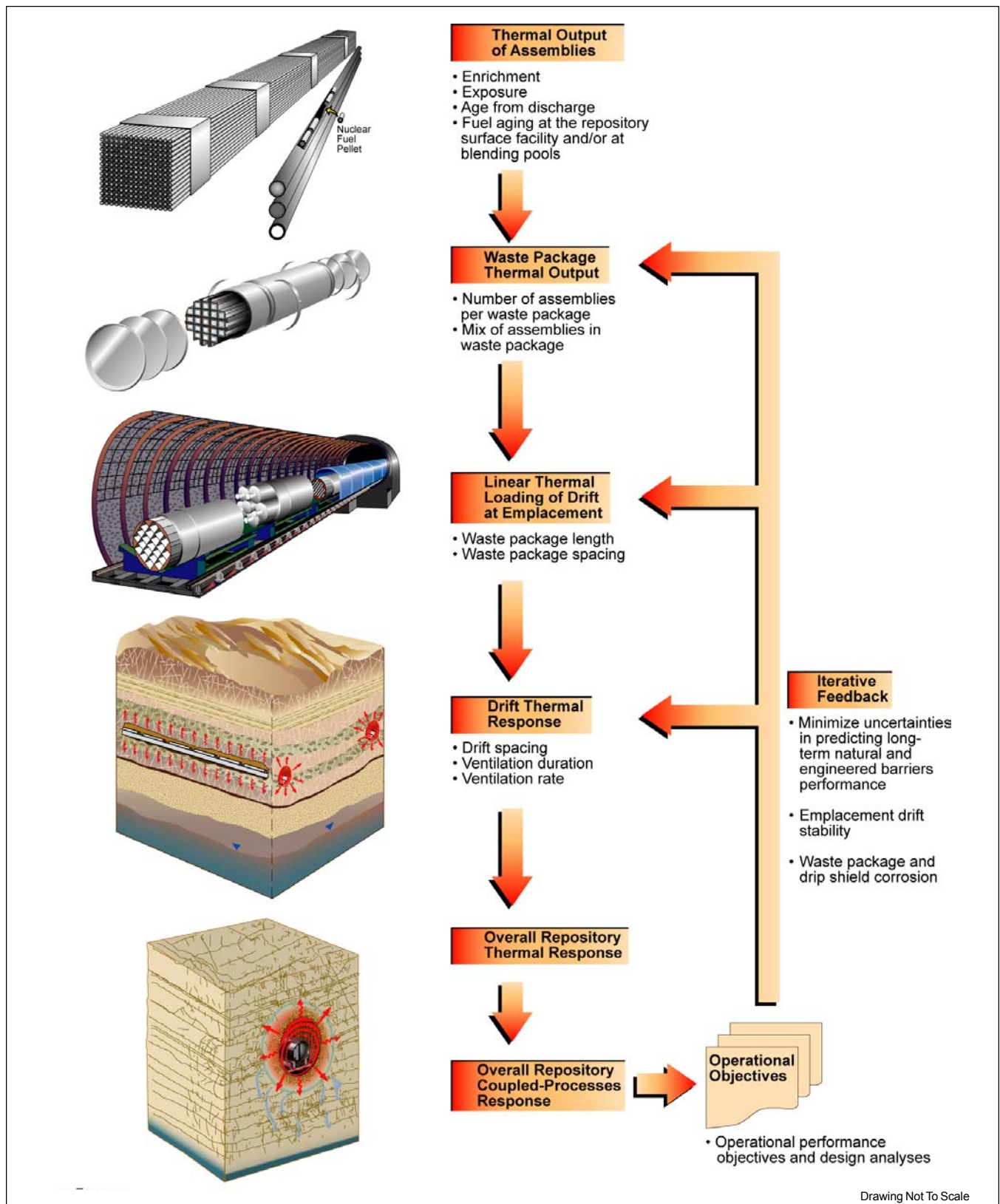
technical review. The final draft of the model report will be available in Fiscal Year 2002, and work on a transient model is scheduled to be completed in Fiscal Year 2004. The model is being built in cooperation with the Nevada Test Site; the U.S. Geological Survey; the Bureau of Indian Affairs; Nye, Lincoln, and Clark Counties in Nevada; Inyo County in California; the National Park Service; the U.S. Air Force; and the Nevada State Engineer's Office. Our model is a tool for simulating and evaluating the effects of climate change on the regional water table.

In addition to the key results discussed above, many ongoing monitoring, data collection, analysis, and modeling activities continued. Some of the areas being studied include: how the chemical composition of water near the emplacement zone may change as minerals

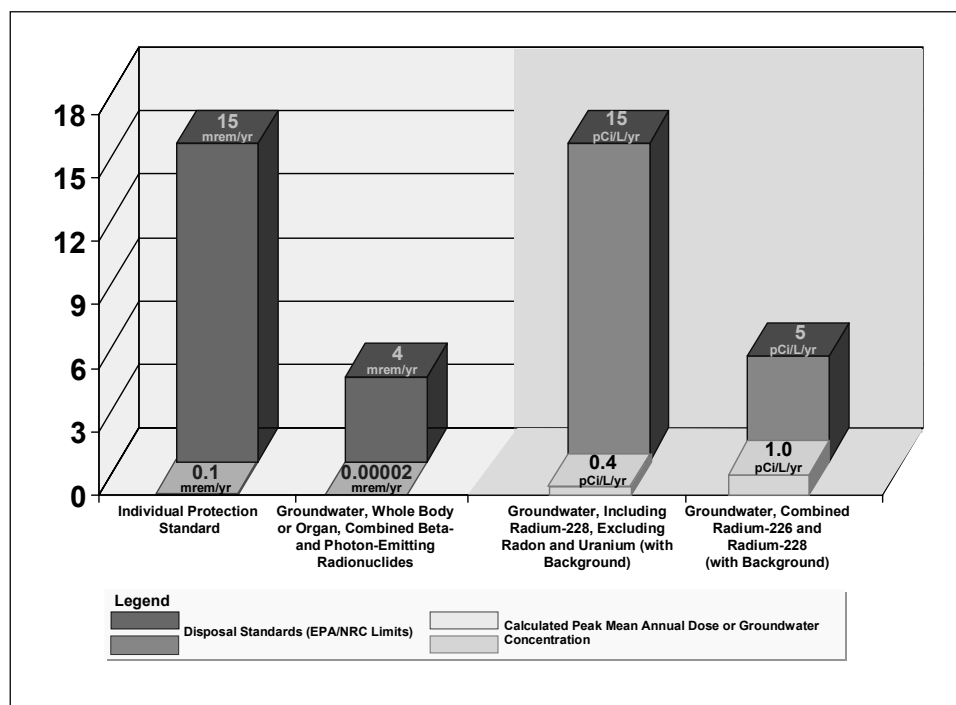
are precipitated and redissolved due to heating and cooling; delineation of the regional groundwater flow system; and a search for evidence of fast paths that could facilitate percolation of water to the repository horizon.

Design and engineering accomplishments

In Fiscal Year 2001, OCRWM conducted sensitivity studies of the design and analysis concepts presented in the S&ER to determine critical variables and to confirm the robustness in the prediction of the repository's performance. This evaluation also included more realistic models and improvements to models that incorporated our understanding of new science and data developed after preparation of the S&ER. The new models and data were used to evaluate a wide range of thermal operating modes. The insights from this additional analysis help to increase our confidence in the models and predictions of a potential repository's performance.



Variables affecting the thermal performance of the repository



Design must demonstrate compliance with strict radiation protection standards

In Fiscal Year 2001, we expanded the testing and analysis that support the technical basis for predicting the waste package materials' performance in the expected conditions of the repository. OCRWM conducted an International Waste Package Materials Performance Peer Review. The peer review report was structured around five subissues: (1) potential degradation modes; (2) long-term behavior of corrosion resistant metals; (3) composition of aqueous environments; (4) localized corrosion; and (5) stress corrosion cracking. Although the peer review interim report identifies some issues regarding waste package materials performance, it also provides a basis for optimism that we can substantially reduce remaining uncertainties about long-term performance of waste package materials through future experiments and analysis. Many of the interim report's recommendations for additional testing and analysis have been included in our yearly work plans. However, budgetary constraints have impacted our ability to complete the work scope. The peer review final report was released in the spring of 2002.

During Fiscal Year 2001, work on the design of surface facilities supported development and preparation of site

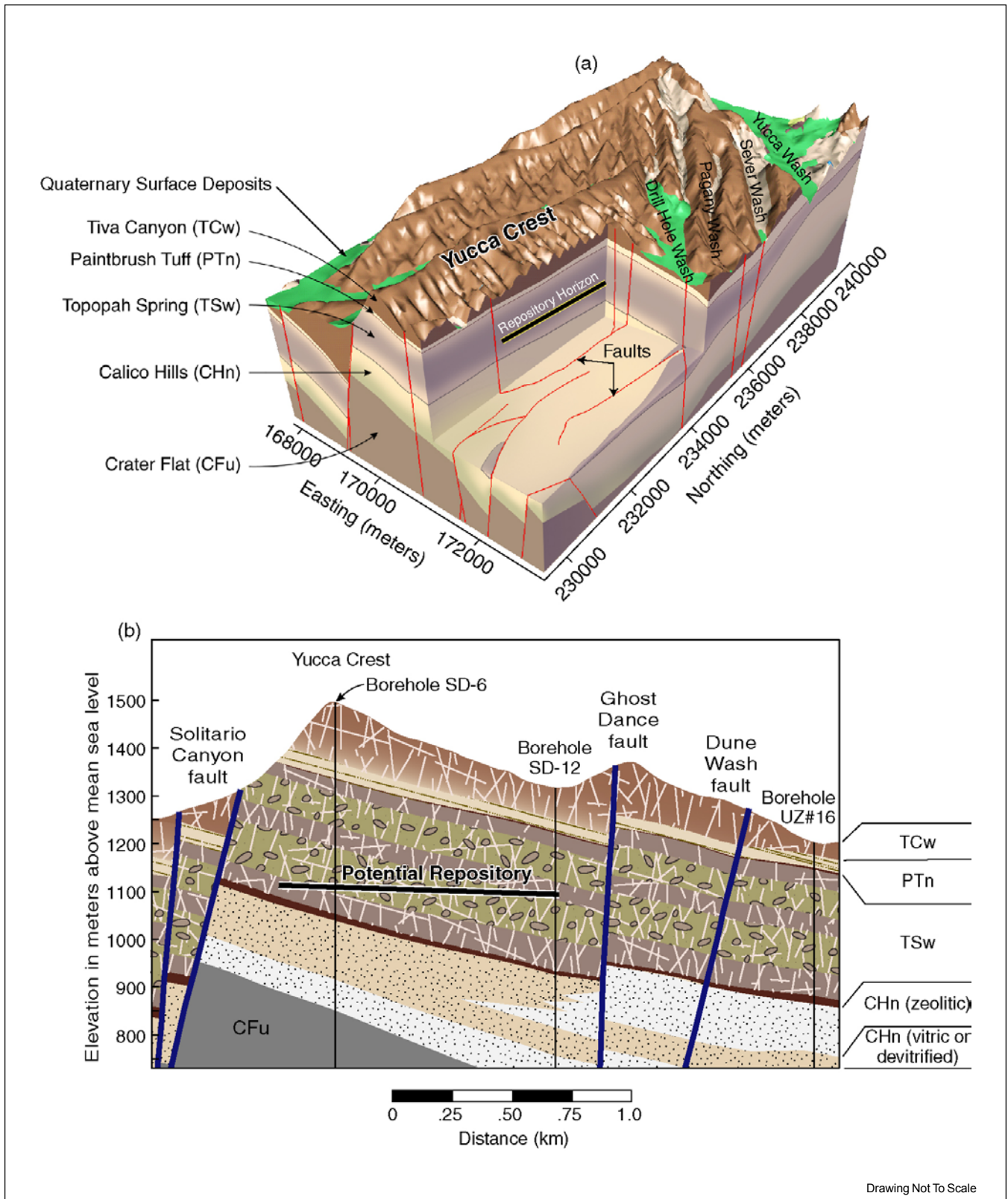
recommendation technical baseline documents for the site recommendation. Surface facility work also included evaluations of the waste handling building modular design concept, which may help meet expected budget constraints, and spent nuclear fuel handling operations. We began work on the surface facility site development plan, which will provide a layout of the facilities and a plan and schedule for development.

The Regulatory Framework for Repository Development

The requirements for the repository regulatory framework have evolved over time. The Nuclear Waste Policy Act (NWPA) directed EPA to establish generic radiological protection standards for repositories, NRC to establish licensing criteria for geologic repositories, and DOE to issue general guidelines for selecting repository sites for site characterization. The 1987 Nuclear Waste Policy Amendments Act limited characterization of candidate repository sites to Yucca Mountain. The Energy Policy Act of 1992 directed EPA to develop site-specific radiation standards for a repository at Yucca Mountain and directed NRC to revise its repository licensing criteria to be consistent with EPA's standards. DOE, accordingly, decided to amend its general siting guidelines to reflect a site-specific evaluation. This regulatory framework was finalized shortly after the end of Fiscal Year 2001.

EPA radiation protection standards

After receiving public comment on its 1999 proposed rule and refining certain requirements, EPA finalized its radiation protection standards and issued the final rule, 40 CFR Part 197, on June 13, 2001. The final rule



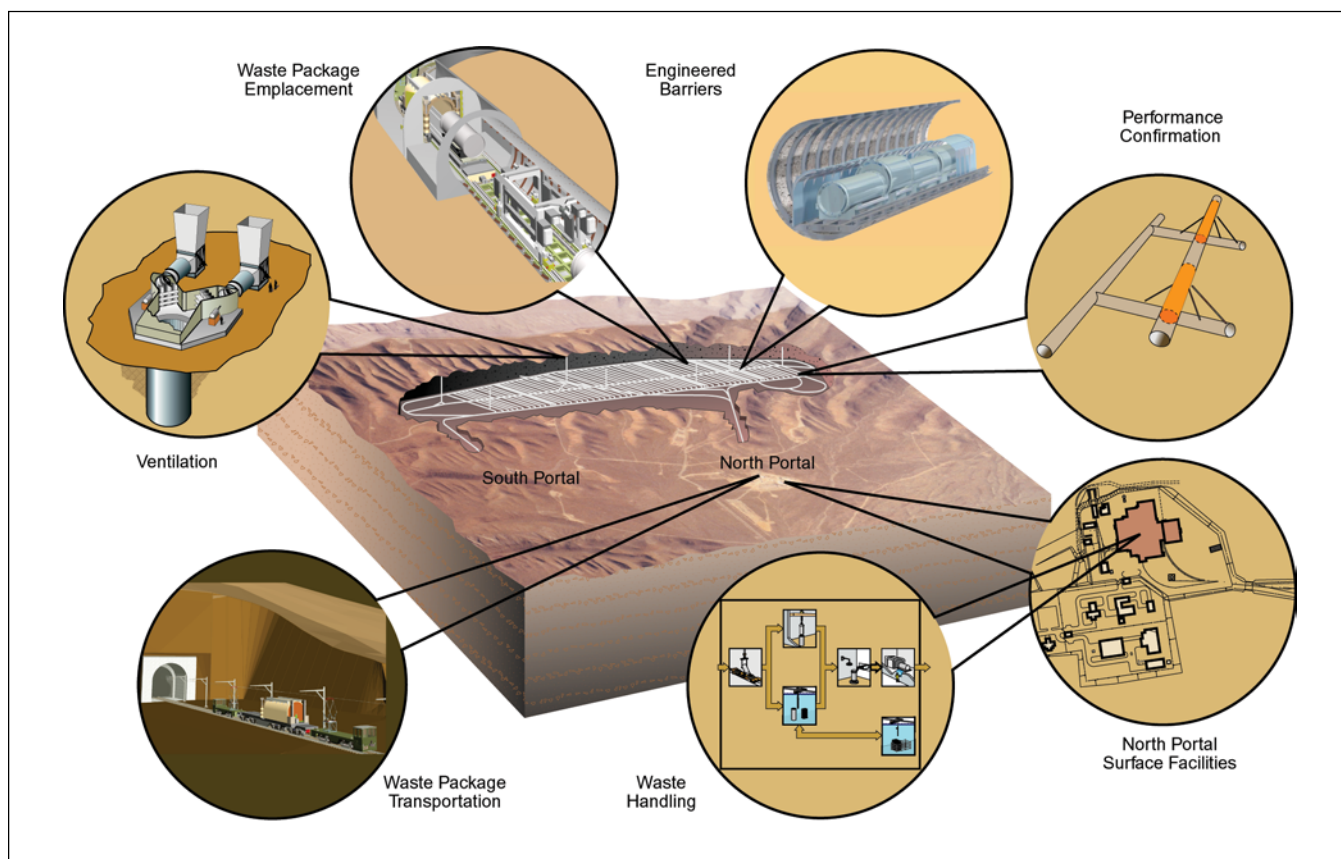
Yucca Mountain site-scale geology

remains consistent with the radiation limits prescribed in the proposed rule for the three public health and environmental standards for disposal: an individual protection standard (15 mrem/year); a groundwater protection standard (4 mrem/year); and a human intrusion standard (15 mrem/year). The compliance location is, effectively, a point 18 km (11 miles) in the direction of the predominant groundwater flow. More information is available at the EPA's website: <http://www.epa.gov/radiation/yucca/>.

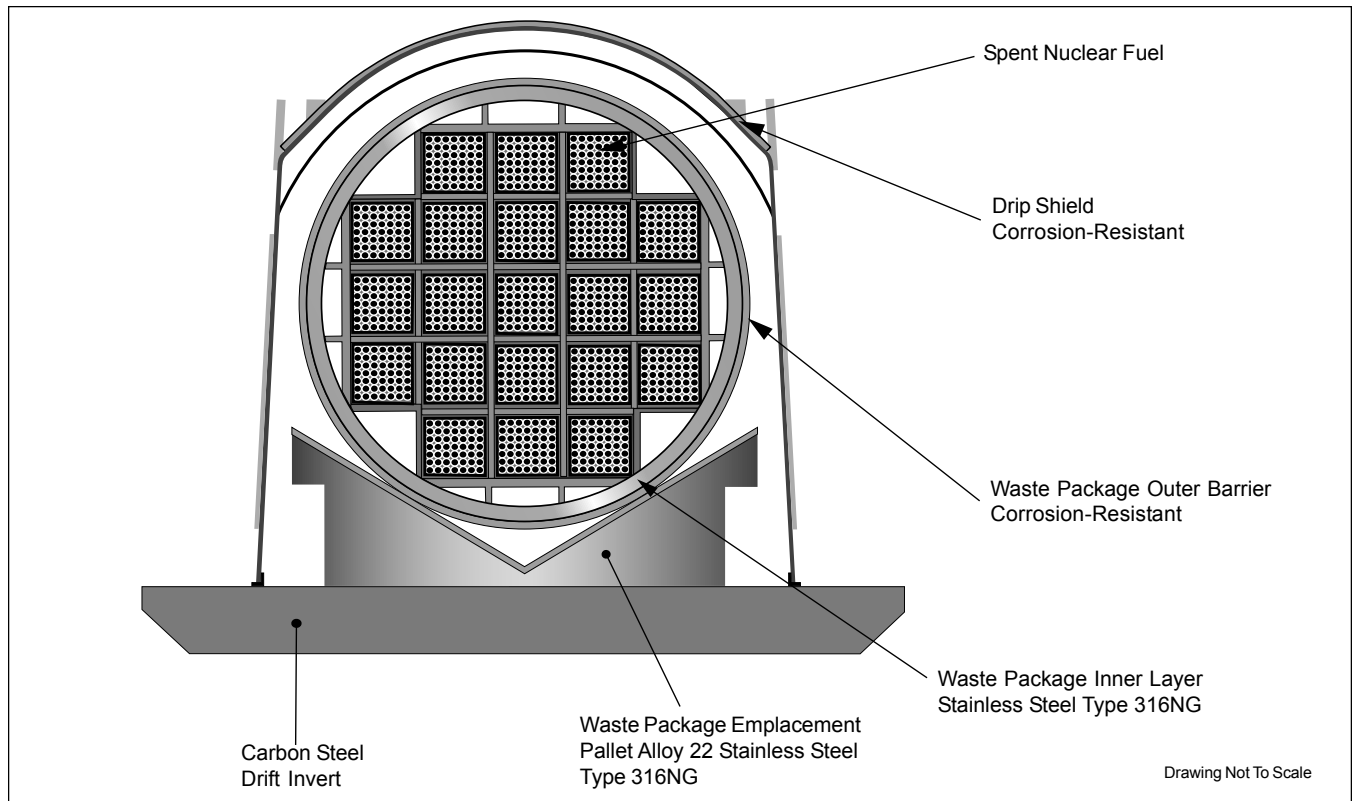
The standards are designed to protect the residents closest to a potential repository by establishing maximum levels that are within EPA's acceptable risk range for environmental pollutants. Following the release of the rule, Energy Secretary Abraham stated that the standards are "tough and challenging," but DOE believes it can "meet the requirements."

NRC licensing regulation

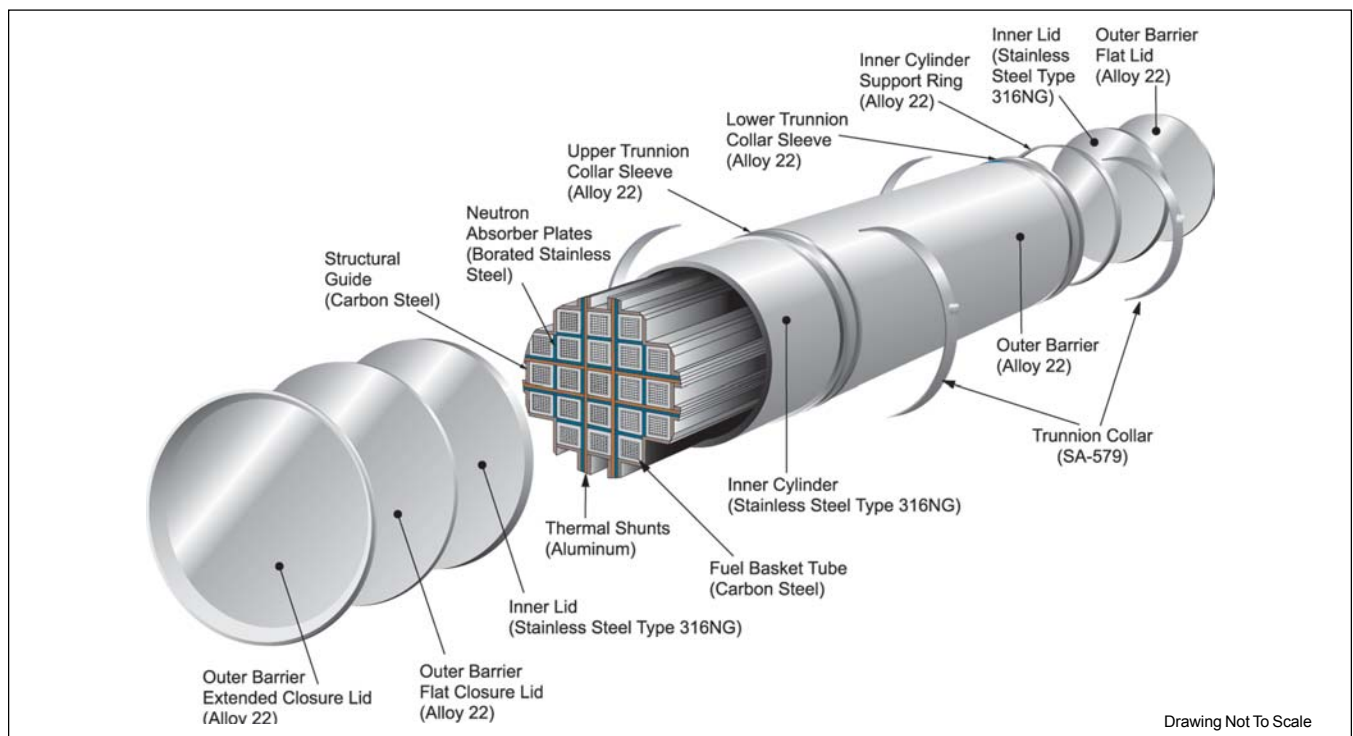
As directed by the Energy Policy Act, NRC's role is to implement the public health and safety standard established by EPA in any licensing process NRC may conduct for a repository at Yucca Mountain. NRC published its proposed licensing criteria in February 1999. NRC finalized these licensing criteria and published them in the final 10 CFR Part 63 on November 2, 2001. NRC incorporated EPA's public health and environmental standards in its final rule. NRC also clarified descriptions and incorporated definitions, where necessary, and added standards which were not addressed in NRC's proposed rule, such as the separate groundwater protection standard and the associated requirements for calculating radionuclide releases to the groundwater. More information is available at the NRC's website: <http://www.nrc.gov/>.



Proposed monitored geologic repository facilities at Yucca Mountain



Cross-sectional illustration of an emplaced alloy 22 and stainless steel dual-metal waste package



21-PWR absorber plate waste package design

DOE siting guidelines

DOE issued repository siting guidelines at 10 CFR Part 960 in 1984, when multiple sites were under consideration for a repository, and proposed a revision to them in 1996 that focused on evaluating the suitability of the Yucca Mountain site. After a supplemental notice of proposed rulemaking in November 1999, and further public comment, the final guidelines, *General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories; Yucca Mountain Site Suitability Guidelines*, 10 CFR Parts 960 and 963, were published on November 14, 2001. The amendment of 10 CFR 960 and promulgation of 10 CFR 963 completed the regulatory framework the Secretary used to evaluate whether the Yucca Mountain site is suitable for development as a repository. The Department's repository siting guidelines are available on the OCRWM website at <http://www.rw.doe.gov>.

Project Management

In Fiscal Year 2001, we produced or revised several technical baseline documents that define our understanding of the natural and engineered components of a repository system and ensure their thorough integration. Systems studies were completed to support decision-making on technical changes.

In Fiscal Year 2001, the most significant change was the incorporation of a broader repository temperature range into the technical baseline documents, providing for a more flexible repository operating mode that could address a wider range of thermal management options. In our modifications, we continued to upgrade web-based information management tools to support integrated technical, cost, and schedule planning. We established a comprehensive data base of environment, safety, and health requirements to clearly articulate, for ourselves and for oversight agencies, the tasks and responsibility assignments for the activities we conduct to ensure the health and safety of the public and our workers.

Project schedule planning

The Yucca Mountain Site Characterization Project uses a "rolling-wave" schedule that has more detail in the early years and less detail in the later years. Each year, the Project updates its planning and then schedules the next increment of work in detail; this allows managers to perform their work against a detailed plan and to identify the skill mix and hours needed to perform future work. During the Fiscal Year 2001 update of the multiyear plan, the Project planned all work activities that would be necessary for a license application.

Protecting Workers, the Public, and the Environment

Fostering a nuclear safety culture

The framework for environment, safety, and health across the DOE complex is based upon a set of written policies, rules, orders, and standards. The implementation of these directives establishes a safe workplace for the protection of workers, the public, and the environment, and provides a documented means of performing work safely. We have continued to maintain an outstanding safety record. In Fiscal Year 2001, our safety performance indicators have demonstrated that our Recordable Injury/Illness Case Rates and Lost Workday Injury/Illness Case Rates are consistently better than industry standards.

In Fiscal Year 2001, we implemented our Zero Accident Philosophy (ZAP), which establishes the framework and the responsibilities for a project goal of zero incidents and accidents. OCRWM recognizes that workplace accidents are costly, preventable, and unacceptable. With the implementation of the ZAP approach, OCRWM is committed to the goal of eliminating all workplace injuries and illnesses, overexposures to hazardous substances, and hazards to the environment.

OCRWM continued to implement and improve the Condition/Issue Identification and Reporting/Resolution System to centralize tracking, trending, and reporting of



Desert research archaeologists at work on Bare Mountain site near Crater Flat

safety and health conditions/issues and opportunities for improvement. The system provides for problem identification and resolution and supports an integrated safety management core function by providing feedback and continuous improvement. The system is available for use by all employees, and more than 2,100 conditions/issues/resolutions have been entered into the system since its inception.

Environmental protection

Throughout Fiscal Year 2001, OCRWM continued its commitment to minimizing adverse environmental impacts while complying with all applicable Federal, State, and local environmental statutes and regulations and DOE orders. In support of work both above and below ground, our environmental staff continued to meet responsibilities that ranged from training new employees to be aware of their environmental obligations to reclaiming approximately 13 acres of disturbed areas at which scientific studies had been completed.

Environmental compliance

Obtaining and maintaining the required environmental permits was critical to every activity undertaken to characterize Yucca Mountain. These permits cover activities such as those associated with air quality; underground injection of tracers for scientific studies; drinking water, wastewater discharge, and water use; and land management. In Fiscal Year 2001, we maintained compliance with more than 40 environmental permits, plans, and procedures; and our environmental program continued to evolve to address new regulatory requirements. As required to maintain these permits, we continued to submit quarterly and annual compliance reports to the

Nevada Division of Environmental Protection and other regulating agencies.

An area of particular interest within the environmental compliance program is historic preservation. In compliance with the Programmatic Agreement between DOE and the Advisory Council on Historic Preservation, consultation and interactions with 17 Native American Tribes and organizations continued. OCRWM met with Tribal representatives twice during Fiscal Year 2001 to discuss preservation of Native American cultural resources and provide information on the scientific studies and reports we issued.

Compliance verification

To ensure that the conditions and requirements of all environmental permits, plans, and procedures are being fulfilled and applicable regulations are met, staff from DOE's Office of Environment, Safety, and Health conduct frequent, unannounced surveillance field checks.

Functioning in concert with the permitting process, pre-activity land access surveys are undertaken to inventory and protect ecological and cultural resources in areas proposed for surface-disturbing activities. Specially trained personnel thoroughly examine these areas before work begins to identify important plant and animal species, such as the desert tortoise, and items of archaeological significance (primarily Native American artifacts in the Yucca Mountain vicinity). In Fiscal Year 2001, eight pre-activity land access surveys were conducted.



Under Secretary of Energy Robert Card visited Yucca Mountain on July 26, 2001

Data collection and monitoring

As stewards of the environment and in compliance with the conditions of our permits, we monitor air quality, meteorology, water quality, terrestrial ecosystems, and cultural resources (archaeological and Native American) to determine potential impacts from site characterization activities. To date, no significant adverse environmental impacts have been detected.

In Fiscal Year 2001, data collection continued to support repository design, biosphere modeling, TSPA, and response to comments on the draft environmental impact statement. We also maintained land access and land withdrawal agreements and right-of-way reservations with the Bureau of Land Management, the U.S. Air Force, the National Park Service, and the U.S. Forest Service as scientific studies continue at Yucca Mountain and remote sites in southern Nevada and California.

Additional information on these and other environmental program activities can be found in the Site Environmental Report, which is published annually and is available upon request.

External Oversight

NRC establishes regulations for the licensing of nuclear waste facilities including OCRWM. The Nuclear Waste Technical Review Board (NWTRB) has responsibility for evaluating the validity of our scientific and technical work. Meetings held in Fiscal Year 2001 with NRC and the NWTRB are listed in Appendix E. Publications the NWTRB issued in Fiscal Year 2001 are listed in Appendix F.

Interactions with NRC

NRC plays a statutory role in the Civilian Radioactive Waste Management Program: it is responsible for licensing the potential repository and for issuing criteria to govern the licensing process.

Under the NWPA, one of the documents that was required to accompany the Secretarial recommendation of the Yucca Mountain site was preliminary comments from NRC on whether our site characterization and proposed waste form analysis appear sufficient to serve as the foundation for a license application. Based on

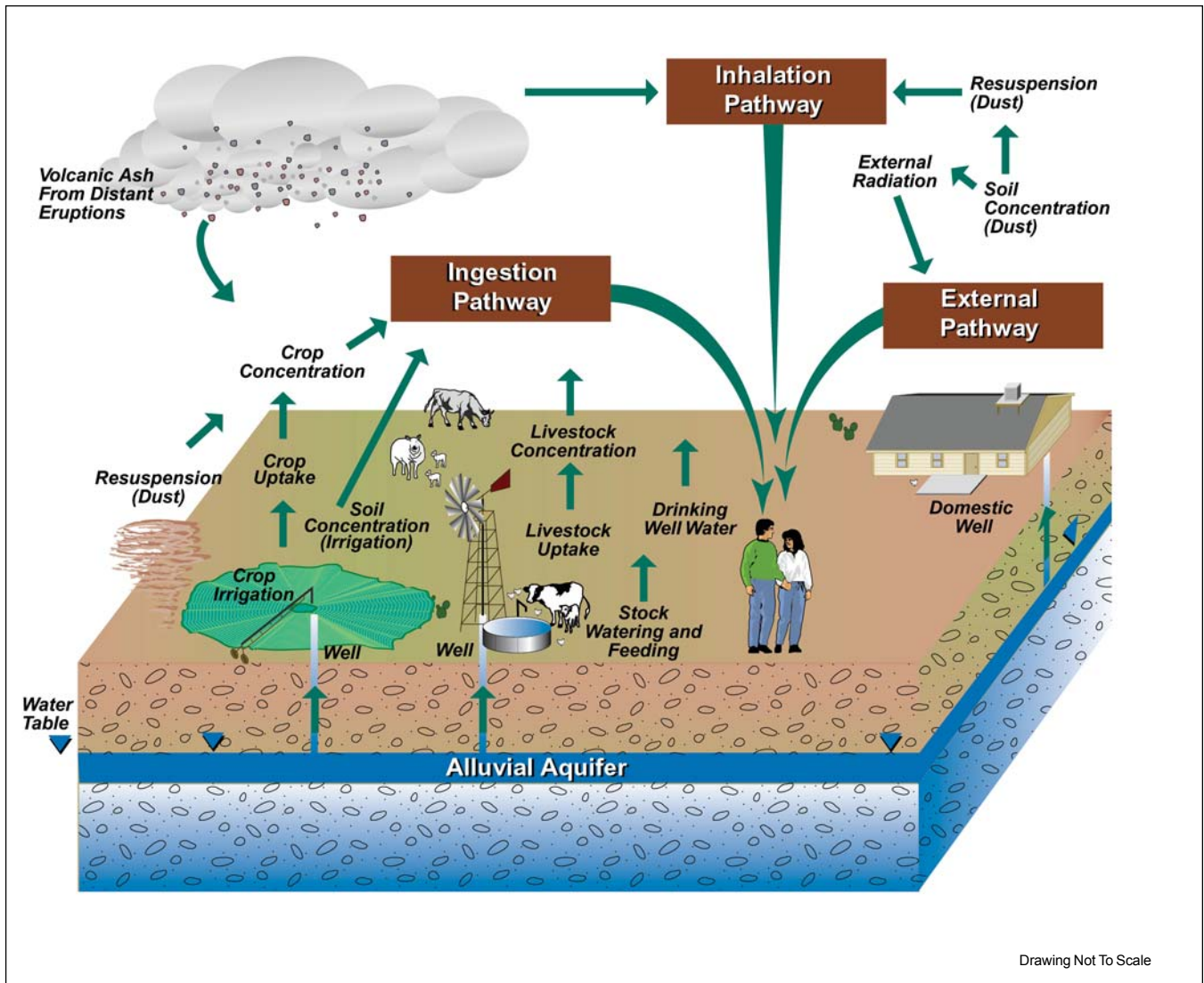


Illustration of the natural transport pathways and processes contributing doses to biosphere

the work OCRWM documented in Fiscal Year 2001 and information NRC gained from many years of pre-licensing interactions, NRC provided its sufficiency comments on November 13, 2001. The sufficiency letter stated, “The NRC believes that sufficient at-depth site characterization analysis and waste form proposal information, although not available now, will be available at the time of a potential license application such that development of an acceptable license application is achievable.”

This sufficiency statement does not draw conclusions concerning the actual licensability of the Yucca Mountain site. NRC emphasizes that “NRC’s licensing

decisions, in terms of a potential repository at Yucca Mountain, will not occur until DOE submits a high-quality license application, the staff completes its independent safety review and issues a safety evaluation report, NRC provides an opportunity for a hearing, and NRC makes its final determination of whether the DOE license application meets NRC regulations. Any NRC licensing decision will be based on all the information available at the time of decision.”

NRC’s strategic planning calls for early identification and resolution of issues at the staff level before a license application is submitted. To provide feedback on key issues, NRC has developed nine issue resolution

status reports that define criteria for resolving each issue and report on its status, including areas of agreement and NRC staff comments.

Fiscal Year 2001 technical exchange meetings with NRC addressed thermal effects on groundwater flow, evolution of the near-field environment, repository design and thermal-mechanical effects, and improvements to the key technical issues meeting process. In addition, through management and quality assurance meetings, we kept NRC informed of our overall progress and ensured that issues needing management attention were addressed.

As we move closer to potential licensing, quality assurance issues become more important as discussion topics with NRC. In Fiscal Year 2001, both OCRWM and NRC identified quality assurance issues and technical discrepancies. We have focused intensively on resolving concerns about quality assurance and NRC has continued to closely monitor our progress. More information on our quality assurance program is presented in Chapter 4.

Interactions with the NWTRB

The NWTRB was created by Congress and is composed of distinguished experts nominated by the National Academy of Sciences and appointed by the President. It acts as a full board and through five panels organized around site characterization; the repository; the waste management system; the environment, regulations, and quality assurance; and performance assessment. Pursuant to the NWPA, as amended, the NWTRB must report its findings, conclusions, and recommendations to Congress and the Secretary of Energy at least twice a year. In April 2001, the Board released its *Report to the U.S. Congress and the Secretary of Energy*, summarizing its calendar year 2000 activities.

In its report, the NWTRB identified four priority areas for the technical evaluation of Yucca Mountain: meaningful quantification of conservatisms and uncertainties in performance assessments; understanding of the processes involved in predicting waste package corrosion; comparison of the base-case repository design with a low-temperature design; and

development of multiple lines of evidence to support the safety case for the repository. This report echoed earlier, similar comments by the NWTRB. OCRWM conducted additional analyses in Fiscal Year 2001 to address lower temperature design and the Board's other concerns.

In Fiscal Year 2001, the full NWTRB held four meetings. Two of these meetings addressed a range of scientific and technical issues, and one focused on development of multiple lines of evidence. The fourth meeting, in September 2001, was a special three-day meeting to review Yucca Mountain site characterization activities. In addition, the NWTRB's Performance Assessment and Repository Panels held a joint meeting to review the Supplemental Science and Performance Analyses, and the Repository Panel held an International Workshop on Long-Term Extrapolation of Passive Behavior.

More information about the NWTRB and the text of correspondence between the NWTRB and OCRWM's Director are available on the NWTRB's web site at <http://www.nwtrb.gov>.

Relations with Affected Parties

Under the NWPA, the State of Nevada and the affected units of local government are entitled to exercise oversight of site characterization activities and to receive financial assistance for this purpose. Affected units of local government (AULG) include Nye County and nine contiguous counties, including Inyo County in California. In Fiscal Year 2001, Congress continued to provide financial support to oversight efforts by the 10 affected counties and the State of Nevada; Congress provided \$6 million to the counties and \$2.5 million to Nevada.

The NWPA also gives the State and Nye County the authority to conduct independent investigations and to receive funding for an onsite representative. The State has not designated such a representative, but Nye County has, and its representative continued to oversee our work in Fiscal Year 2001. Nye County implemented its Fiscal Year 2001 initiative to drill boreholes near Amargosa Valley, Nevada. Continued sampling and data collection are yielding information about water flow and fault structure in the saturated

zone. OCRWM provided Nye County an additional \$5,859,000 in Fiscal Year 2001 for this program. Information about Nye County's oversight program can be found through its web site at <http://www.nyecounty.com>.

During Fiscal Year 2001, we continued interactions with the 10 AULG counties and the State. On April 11, 2001, OCRWM staff held a teleconference with the representatives of the AULGs to provide information on the Fiscal Year 2002 budget request to Congress. OCRWM staff hosted a meeting with county representatives in Las Vegas, Nevada on May 4, 2001. We also provided Project updates to the county commissions, boards of supervisors, and State and local government committees. We conducted 15 site tours for community, county, and State officials.

We continued funding our PETT agreement with the State of Nevada, and Nye and Clark Counties. Under Section 116(c)(3)(A) of the NWPA, these payments are intended to compensate for taxes that affected entities would have collected on site characterization and the development and operation of a repository if they were authorized to tax Federal Government activities. A total of \$10.9 million was provided in Fiscal Year 2001, of which \$10 million went to Nye County, \$785,000 went to the State of Nevada, and \$115,000 went to Clark County.

In Fiscal Year 1998, OCRWM and the University and Community College System of Nevada entered into a cooperative agreement for conducting scientific studies that could augment our own studies of the Yucca Mountain site. Under this agreement, up to \$40 million may be applied to such studies through Fiscal Year 2003; through Fiscal Year 2001, \$20 million had been approved for 34 tasks. Subjects of the studies include rain accumulation in the Yucca Mountain area, fluid inclusion in rock fracture fillings, water infiltration through the site, and seepage into drifts and onto potential waste packages. Studies will also contribute geochemical data for development of the single regional groundwater model described above.

Yucca Mountain Site Characterization Project Outreach

In Fiscal Year 2001, OCRWM completed and released to the public many significant documents that have been described throughout this report, beginning the first steps in the statutorily defined consideration process supporting a national decision on whether to go forward with developing a geologic repository. In connection with those developments, we conducted briefings for AULG and Tribal representatives. OCRWM maintained an active communications program to provide timely and accurate information about the Yucca Mountain Site Characterization Project to stakeholders, interested groups, and members of the public.



Exterior view of the Yucca Mountain Science Center and Information Office, Las Vegas, NV

We promoted two-way communications with technical audiences and the general public through a tour program, speakers' bureau, and exhibits at key events. In Fiscal Year 2001, we conducted 222 tours of Yucca Mountain, briefing more than 4,478 visitors about the status of activities there. More than 8,540 people at 22 conferences and events held throughout the United States visited our exhibit. Through our speakers'

bureau, we made 84 presentations to civic, educational, and professional groups, reaching more than 6,480 people.

Our Internet site remained an important communications tool in Fiscal Year 2001. Various sections of the web site were accessed more than 9,760,000 times by visitors during 336,589 user sessions.

We answered more than 10,600 phone calls on our toll-free information line, and shipped 18,896 documents to 943 requestors worldwide. Our three Nevada Science Centers provided information to 8,211 visitors.

Through our educational activities in Nevada, we reached more than 12,926 students, teachers, and parents. The activities they participated in included workshops on energy, geology, and environmental studies; field trips to Yucca Mountain; geology merit badge workshops for Girl and Boy Scouts; science discovery days; classroom presentations; and participation in the JASON Project, a nationwide, interactive science program.

Fiscal Year 2001 in Context

During Fiscal Year 2001, the Yucca Mountain Project helped move the Program significantly closer to a site recommendation decision. We completed the TSPA-SR to assess the long-term performance of the potential repository; we published documents that the NWPA requires to accompany the President's recommendation; and we held extensive public hearings in the vicinity of the site to inform and solicit the opinions of local residents.

OCRWM believes that waste acceptance in 2010 remains an ambitious, but achievable, target. Accomplishing this goal will require careful planning and phasing of project activities, timely decision-making, and adequate funding. We are preparing the license application and are currently developing and evaluating alternative scenarios to identify the most effective approach for initial surface facility and repository construction. Long-lead activities, such as construction of a rail line to the site, will also need to begin soon.



Public open house visitors tour the crest of Yucca Mountain, fall 2001

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