



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

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M E M O R A N D U M

DATE: March 19, 1991  
FOR: Joseph Holonich, Acting Deputy Director, HLPD,  
Division of High-Level Waste Management, M/S 4 H 3  
FROM: *JWG* John W. Gilray, Sr. OR - YMP  
SUBJECT: YMP Site Report for the months of December, 1990, and  
January and February 1991

I. QUALITY ASSURANCE

A. Status of YMP QA Workshops

\* QA Workshop on Software.

YMP QA Software Workshops were held in Las Vegas on January 22 through 23, and on February 4 through 7, 1991, with managers, senior scientists, engineers, QA engineers, and software developers and users from DOE and participants in attendance. This office and members of the HLWM QA office participated as observers.

The goals of the QA Software Workshop was to identify a common set of precisely defined software QA requirements that will (1) produce deliverables that will withstand the rigors of the licensing process, and (2) be acceptable to the users by allowing flexibility and avoiding unnecessary controls.

During the first phase of the QA Software Workshop, 82 identified specific software quality-related concerns were evaluated and consolidated into the following three basic problem statements.

- ◆ The current software QA requirements are ambiguous, lack a basis for need, and are poorly understood.
- ◆ Software QA requirements must include a software classification scheme based on the nature, importance and intended application and must be commensurate with impact on quality.
- ◆ Software QA requirements focus on documentation of all phases/cycles of software development, not on testing/validation. Emphasis needed on the quality of software required for licensing and not paper trail.

These three basic problem statements were evaluated and discussed during the second phase workshop and recommended action items to resolve these three problems were identified in short term and long term action plans. The short term plan addresses the need to (1) identify and clarify existing software QA controls in Section 19 of the QARD; (2) include software QA in a mock licensing process and (3) enhance the grading software process to achieve flexibility in software development and use, where appropriate. The long term plan addresses the need to establish a standing software working group to identify the optimum software QA requirements for licensing utilizing outside experts and the NRC for consultations and assistance.

Members of the software QA workshop presented their findings, recommendations, and action plans to DOE/YMP management (M. Blanchard, D. Horton) which resulted in management direction for the workshop team members to carry out the recommendations and action items.

A formal QA workshop presentation was given to John Bartlett and Carl Gertz on February 8, 1991, at Las Vegas. The workshop process, findings, recommendations, and action items of the two major QA workshops were discussed. At the conclusion of this presentation John Bartlett and Carl Gertz both complemented the workshop members in regards to the progress and results of the workshop and expressed an endorsement of high priority to carry out the identified recommendations and action items.

This office has described these workshops in more detail and provided background information on the specific action items in memorandums from P. Prestholt/J. Gilray to John Linehan dated February 13, 1991.

NRC observation comments:

- ◆ The workshop was well attended by scientists, engineers, and QA personnel from the participants knowledgeable in software QA.
- ◆ There was an effective, interactive, constructive, and cooperative process between the workshop team members which resulted in the identification of software concerns, problems, and recommendations and action items to resolve these software QA problems and concerns.

- ◆ The identified short term and long term recommendations and action items appear sound and meaningful. The completion of the short term action items may very well resolve the overall software QA problems to the extent that it may not be necessary to carry out the long term action.
- ◆ It is encouraged that the NRC/HLPD continue to work with the software workshop members in providing appropriate consultations where necessary.
- ◆ This office will keep Ken Hooks, HLPD, informed of all future workshop meeting activities and the status of action items.

In regards to the software long term action to establish a standing YMP Software Advisory Group, selected members of the workshop developed a draft charter for the Advisory Group and formally submitted it to the participants and the YMP for review and comment. Essential objectives of this charter are:

- To facilitate communication, discussion, and resolution of software-related concerns arising from management, quality assurance, and technical interactions of the Yucca Mountain Project.
- To contribute to the evolution and implementation of a coherent and stable software management program that: 1) makes optimum use of standard software engineering practices; 2) is compatible with accepted scientific practices; and 3) provides suggestions such that the products of Yucca Mountain activities and basic and applied research are usable in legal and regulatory arenas.
- Provide advice and consultation to the Department of Energy,

Yucca Mountain Site Characterization Project Office on software-related matters for their consideration.

Further details of this draft charter of the Advisory group are provided in Enclosure 1.

**B. Readiness Review**

♦ **General**

A YMP Readiness Review was conducted by the Readiness Review Board and Review team on December 18-19, 1990, and on January 9-10 and 11, 1991, to determine through objective documented evidence that all prerequisites have been satisfactorily met for the initiation of Midway Valley trenching activities as described in Study Plan 8.3.1.17.4.2, "Evaluating the Location and Recency of Faulting Near Prospective Surface Facilities". As a result of these reviews, action items were identified and carried out to close out identified open issues. The Review Board determined on January 21, 1991, that all prerequisites had been successfully completed to start the Midway Valley trenching activities with the exception of the air quality and water appropriation permits. The State of Nevada has not accepted DOE applications for these permits. Therefore work cannot begin at the site until this issue is resolved.

NRC members (K. Stabline, K. McConnel, P. Prestholt, and myself) participated as observers throughout various phases of this readiness review.

♦ **Readiness Review Process.**

This readiness review was performed in accordance with Administrative Procedure 5.13Q. Integral to the readiness review

process is the Readiness Review Checklist which specifies prerequisites, requirements and other information that form the basis for the Readiness Review. The procedure requires that the following items be addressed, as a minimum:

- a. Work activity prerequisites have been satisfied. For example, the following items should be reviewed: Plans, prerequisites lists, and requirements documents.
- b. Implementing Line, Quality Assurance, and Administrative Procedures related to the next phase of work have been developed and reviewed for adequacy and appropriateness.
- c. Personnel have been suitably trained and qualified.

Note: This readiness review was not intended to reassess the acceptability of the technical content of the study plan, procedures, or work packages associated with the Midway Valley trenching activities.

Enclosure 2 provides a summary of the check list items.

♦ Comments Resulting from Observing this Readiness Review

As a result of the NRC observation of this readiness review it was pointed out that the review process was limited in scope and that it did not address all pertinent prerequisites identified on the Midway Valley Pert Network. The YMP management and the Review Board decided to recess the Readiness Review meeting to allow for an increase in the readiness review scope which would be consistent with the prerequisites in the Pert Network. Upon completion of this added scope and review it appeared that the overall readiness review process actions and results were effective and meaningful in determining that prerequisites had been adequately identified and that objective documented evidence were in place and acceptable for determining if prerequisites had been met.

At the completion of the readiness review the YMP conducted interviews with key participants involved in the review process for the purpose of identifying lessons learned and recommendations for improving future readiness reviews. This office will review the results of these interviews and report as appropriate the improvements to the readiness review process.

A package containing the results of this Readiness Review and the completed check list items have been sent by this office to Ken Hooks of HLPD.

The YMP is also evaluating whether it will be necessary for conducting a readiness review for the Calcite Silica activities since regular in-house project and management reviews of prerequisites may be determined sufficient to determine readiness to start site work.

#### C. Miscellaneous

- ♦ Don Horton's official transfer date to his new position of OCRWM QA Director at Washington, D.C. is April 24, 1991. This will allow for the vacated YMP QA Division Director position to be officially posted and allow candidates to apply and be interviewed for this GS-15 QA position. Filling this position certainly should increase the QA program effectiveness and interactions with YMP and participants since Don Horton has been spread quite thin in managing both the Las Vegas and Washington QA offices.
- ♦ The YMP is revising their trending program which is expected to be more realistic and meaningful to the YMP trending needs. Also the YMP is involved in revising their QA program procedures which will allow for more efficient and timely revision to their QA program and procedures. Copies of these procedures will be submitted to the HLPD QA department by this OR office when released.

- ♦ This OR office has been actively involved in moving to new offices at the Old Post Office Building (1932) in the city of Las Vegas. The new address is 301 E. Stewart Avenue, Room 203, Las Vegas, NV 89119. Our phone and "fax" numbers will remain the same.
- ♦ Within the next 9 months I will be devoting a considerable amount of my time working for the Division of Low Level Waste Management and Decommissioning (LLWM). My present assignment will be to develop QA/Administrative procedures for the LLWM. In this endeavor I will be reporting to Clayton (Larry) Pittigilo of LLWM.

## II. WASTE PACKAGE

The LLNL December and January monthly status reports are enclosed (Enclosure 3). It is encouraged that comments and/or questions regarding the contents of these reports be directed through this office for action and resolution in order to minimize the impact on the YMP.

There are no new issues that this office has identified that have not been brought to management's attention.

cc w/enc: K. Hooks, M/S 4H3; J. Bunting, M/S 4H3; J. Latz  
wo/enc: D. Shelor, C.P. Gertz, R.E. Loux, M. Glora, G. Cook,  
D.M. Kunihiro, D. Weigel, B. Youngblood, J. Linehan, M/S 4H3;  
H. Denton, M/S 17F2, R. Bernero, M/S 6A4; H. Thompson,  
M/S 17G21; S. Gagner, M/S 2G5; E. O'Donnell, M/S NLS260

Enclosure II



**Department of Energy**  
**Yucca Mountain Site Characterization**  
Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

WBS 1.2.9.3  
QA

FEB 14 1991

**Distribution**

**U.S. DEPARTMENT OF ENERGY YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT  
QUALITY ASSURANCE SOFTWARE WORKSHOP**

Enclosed is the draft charter for the Yucca Mountain Software Advisory Group (Workshop Action Item 1).

Please review and facsimile your comments to William Price, MAC Technical Services Co. (MACTEC), Las Vegas, Nevada, by close of business on Friday, February 22, 1991. The MACTEC facsimile number is (702) 794-7125 or FTS 544-7125.

If you have any questions, please call either Joseph R. Caldwell at (702) 794-7559 or FTS 544-7559 or Nancy A. Voltura at (702) 794-7972 or FTS 544-7972.

A handwritten signature in black ink, appearing to read "Donald G. Horton".

Donald G. Horton, Director  
Yucca Mountain Quality Assurance Division

YMQAD:NAV-2196

**Enclosure:**  
**Draft Charter**

**cc w/encl:**  
**J. W. Bartlett, HQ (RW-1) FORS**

**PRELIMINARY DRAFT**

**DRAFT B**

**08-FEB-91**

**YUCCA MOUNTAIN SOFTWARE ADVISORY GROUP (AG)**

**OBJECTIVE**

- o To facilitate communication, discussion, and resolution of software-related concerns arising from management, quality assurance (QA), and technical interactions on the Yucca Mountain Project (YMP).
- o To contribute to the evolution and implementation of a coherent and stable software management program that: 1) makes optimum use of standard software engineering practices; 2) is compatible with accepted scientific practices; and 3) provides suggestions such that the products of Yucca Mountain activities and basic and applied research are usable in legal and regulatory arenas.
- o Provide advice and consultation to the Department of Energy, Yucca Mountain Site Characterization Project Office (YMPO) on software-related matters for their consideration.

APPROACH

- o The AG shall foster communication and resolution of software issues by:
  1. Serving as a sounding board for identifying problems, discussing issues, and proposing solutions to software-related concerns that have broad programmatic implications or that are interdisciplinary in nature and could impact multiple activities and organizations. Emphasis will be on innovative quality improvements that could positively impact the technical direction or scope of the Yucca Mountain activities.
  2. Initiating activities to improve communication and produce integrated solutions to software-related problems.
  3. Submission of findings and recommendations to the YMPO Program Manager or designee. Copies shall be forwarded to the Technical Project Officers (TPOs) and each AG member.

SELECTION OF MEMBERS

- o Composition

YMPO will have AG Chair responsibility. TPOs will select members from their staff and take into consideration such factors as

diversity and representation of viewpoints and disciplines and breadth of understanding of the program and goals of YMP activities. The AG Chair will have responsibility to assure all appropriate disciplines are represented. Representation should consist of: technical staff, software engineers, QA, management, Information Resources Management, and Technical Data Management.

An AG secretary will be assigned by the Chair to coordinate preparation of the agenda, distribution of meeting notes, and other administrative matters.

The AG will evaluate meeting and membership effectiveness on an annual basis. Membership should be rotated on a periodic basis.

MEETINGS

o Frequency and Location

1. The AG shall hold meetings periodically.
2. Additional meetings shall be held as needed with management staff and others as deemed appropriate by the AG Chair.
3. Meeting sites should rotate among the AG member home sites.

- o **Agenda**

The AG shall follow a formal meeting agenda. A summary of the previous meeting topics and list of proposed agenda items shall be distributed prior to each meeting. The agenda may include unresolved topics from previous meetings and new topics or proposals appropriate to the AG objective.

- o **Participation**

The AG may invite experts in various disciplines from within or outside YMP to participate in or make presentations at meetings, and to advise the AG on topics under consideration. Project staff are encouraged to provide input to the AG.

MIDWAY VALLEY READINESS REVIEW CHECK LIST

- A1. Has study plan been approved by U.S. Department of Energy and accepted by the U.S. Nuclear Regulatory Commissions (NRC)?
- A2. Has the Technical Requirements for the Yucca Mountain Project Midway Valley Trenching and Calcite-Silica Activities (YMP/CM0007) been approved and baselined?
- A3. Are the DOE, Participants, and their subcontractors performing quality affecting activities operating under and approved QA program accepted by the NRC? If any programs have exceptions, do they affect these activities?
- A4. Have Quality Assurance (QA) Grading Reports been approved by the Quality Review Board for Midway Valley and related activities?
- A5. Have deficiency documents applicable to Midway Valley activities been resolved and corrective actions implemented?
- A6. Are there any formal Stop Work Orders in effect related to this work from either YMPO or Participants?
- A7. Have experiment and technical procedures required for this work been approved and scheduled to be effective before work starts?
- A8. Have the drawings and specifications for trench excavation been completed, reviewed, and approved?
- A9. Has a test planning package been prepared?
- A10. Are required criteria letters in place.
- A11. Has the YMPO responded to NRC comments on the SCP and Study Plan that relate to Midway Valley activities?
  
- B1. Have the required environmental compliance and land access reviews been completed?
- B2. Have responsibilities (i.e., contractor, project Participants) for work to be conducted been defined in the Work Breakdown Structure Dictionary?
- B3. If funding available to cover field work and engineering support for Midway Valley activities?
- B4. Have relevant interfaces among participants (including memorandum of understanding) been identified and documented?
- B5. Has Planning and Control System (PACS) input been provided by the participants and approved by the Project Office?
- B6. Have participants Safety/Health Plan been reviewed and approved by the Project Office?
- B7. Are records handling procedures in place to transmit data to local and Project Office records systems?
- B8. Are procedures in place to transmit data to Project data bases?
- B9. Has a Job Package been prepared for this study?
- B10. Have applicable Yucca Mountain Site Office Field Operating Instructions been issued?
- B11. Are required support services and equipment available and calibrated, if appropriate?
  
- C1. Have training requirements been identified and are training programs in place to train the involved personnel?

Enclosure 3 (1 of 2)



## Lawrence Livermore National Laboratory

LLYMP9101071  
January 14, 1991

WBS 1.2.9  
"QA: N/A"

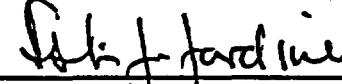
Carl Gertz, Project Manager  
Department of Energy  
Yucca Mountain Project Office  
P.O. Box 98518  
Las Vegas, Nevada 89193-8518

### SUBJECT: Yucca Mountain Project Status Report - December 1990

Attached is the December Project Status Report for LLNL's participation in the Yucca Mountain Project.

If further information is required, please contact Elizabeth Campbell of my staff at FTS 532-7854.

Sincerely,

  
\_\_\_\_\_  
Leslie Jardine  
LLNL Technical Project Officer  
for YMP

LJJ/EC/ec

cc:  
Distribution

### DISCLAIMER

The LLNL Yucca Mountain Project cautions that any information is preliminary and subject to change as further analyses are performed or as an enlarged and perhaps more representative data base is accumulated. These data and interpretations should be used accordingly.

LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT  
MONTHLY TECHNICAL HIGHLIGHTS AND STATUS REPORT  
DECEMBER 1990  
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LAWRENCE LIVERMORE NATIONAL LABORATORY  
(LLNL)  
YUCCA MOUNTAIN PROJECT (YMP) STATUS REPORT

DECEMBER 1990

**1.2.1 SYSTEMS**

**1.2.1.1 Management and Integration**

The TPO and five Technical Area Leaders reviewed LLNL-YMP priorities and resource allocations.

**1.2.1.2.4 Systems Engineering Implementation**

LLNL staff (Core Team Member and Technical Experts) prepared for the Functional Analysis Working Session for "Dispose Waste" scheduled for January 7-18 in Las Vegas.

A Technical Data Submittal was prepared for solubility data (upper limit steady-state concentrations) from C. Wilson's reports HEDL-TME85-22 (May, 1987) and PNL-7170 (June, 1990). This material was reviewed and will be forwarded to the Site and Engineering Properties Database next month.

**1.2.1.4.2 Waste Package Performance Assessment**

On December 12, a meeting was held at LLNL to discuss site suitability issues related to the Human Intrusion Scenario Task. Attendees included individuals from PNL, LBL, SNL and LLNL. A discussion on the SNL problem definition memo on human intrusion was also held. A joint initial problem statement (IPS) which will present the LLNL and SNL methods will be prepared by A. MacIntyre and T. Buscheck (LLNL) and F. Lauffer and A. Ducharme (SNL).

W. O'Connell was an invited participant to a symposium sponsored by the Institute for Resource Management in Airlie, VA on December 12. The symposium was entitled Reassessing U.S. Policies for the Disposal of the Nation's High Level Nuclear Waste. Industry, government, environmental and research leaders were invited to assess the sources of impediments, to look for any areas of common agreement, and to look for innovative solutions.

Staff reviewed the "Unsaturated Zone Hydrology Peer Review Record Memorandum".

**1.2.1.4.5 Geochemical Modeling and Database Development**

Completed a major reorganization of GEMBOCHS. Examined the contents and present/planned use of each comprising table (approximately 100; some dating back several years) and retained in GEMBOCHS only the 46 tables currently accessed by DBAPP and DOOUT. Of the remaining tables, the 21 of potential future use were

archived in a newly-created separate database (GEMBANK); the others were eliminated entirely. This reorganization leads directly to improved run-time performance for DBAPP and DOOUT.

Added literature data for several Uranium acetate complexes (as test species) that are needed for speciation modeling in support of local solubility experiments. Generated a new composite database that contains the Uranium acetate complexes.

A SPARC station IPC was made available for a few days for testing, and the new package was ported to it for testing as personnel on other YMPO tasks here are procuring or evaluating such machines. A few minor incompatibilities were found in the FORTRAN, resulting in the writing of a corrections sheet for the release that was subsequently transmitted to SWRI and LANL. In a comparison of optimized code versus optimized code, the SPARC station IPC ran about 10-15% faster on most problems in the test library than the Alliant FX/80 we have been using as our "big" machine (the SPARC station is a desktop). The Alliant was faster (by only 10-15%) on problems with the very largest number of components, such as simulations of spent fuel dissolution.

All code maintenance activities were terminated this month due to lack of budget. All remaining effort is now focused on finishing the code documentation revisions and packaging records for transmittal to the Local Records Center.

## 1.2.2 WASTE PACKAGE

### 1.2.2.1 Management and Integration

Staff participated in the Sample Overview Committee meeting at the Sample Management Facility, NTS on December 4, 1990.

The TPO and five Technical Area Leaders reviewed LLNL-YMP priorities and resource allocations.

### 1.2.2.2 Waste Package Environment

#### Chemical and Mineralogical Properties of the Waste Package Environment

Input for the Near Field Environment Report is partially complete and has been submitted to the Technical Area Leader.

C. Wittwer has been hired on a consulting basis through LBL to conduct a search of the existing literature on colloids formed by man-made materials in the near field environment. She spoke to the geochemistry group on this work.

Revision of the Geochemistry Study Plan (8.3.4.2.4.1), based on headquarters comments, continued.

Review of the proposed new Study Plan for Man-Made Materials (Geochemistry Study Plan Sections 8.3.4.2.4.1.2 and .6) is in progress.

Modifications to the Activity Plan as a result of review comments are complete. A number will be assigned in January.

#### Hydrologic Properties of the Waste Package Environment

Continued calculations of episodic infiltration events between the repository and the water table which were presented at the PACE90 NRC Exchange in November. The calculations consider 10 and 50  $\mu\text{m}$  fractures. For the 10  $\mu\text{m}$  fractures in the TSw2 and TSw3 units, flow was found to be transitioning from fracture-dominated to matrix-dominated flow.

Staff developed an isothermal unsaturated flow code solving Richard's equation and conducted successful comparison calculations with V-TOUGH for discrete fracture-matrix flow problems. The code has the capability of running many times faster than V-TOUGH for isothermal fracture flow problems. The code currently runs on the SUN workstation and will eventually be ported to the CRAY computer. Work began on a radionuclide transport code which will post-process the flowfields generated by the unsaturated flow codes.

A preliminary plan and schedule for software quality assurance is being developed for the V-TOUGH code in collaboration with the Software Quality Manager. Plans are also being made for the software quality assurance of pre- and post-processing programs for V-TOUGH.

A copy of V-TOUGH was sent to Dr. Todd Rasmussen at the University of Arizona on December 11.

A request was received from Dr. William Lee from the University of California requesting a copy of V-TOUGH. A memo was sent to him for signature as a collaborator. The letter was returned on December 12 and a copy of V-TOUGH was sent to Dr. Lee.

The fracture healing experiment is continuing after repairs on equipment were completed. The effect of flowing steam on gas permeability of a Topopah Spring tuff sample will be determined. Also, water that is condensed from the steam that flows through the sample will be collected for chemical analysis.

Work continued on the hydrology chapter of the Near Field Environment Report. This work includes additional model calculations investigating the critical fracture aperture for throttling matrix drying during the Prototype Engineered Barrier System Field Tests (PEESFT) as well as incorporating the nonequilibrium fracture-matrix flow work which was presented at the PACE90 NRC exchange.

A paper by T. Buscheck entitled "Nonequilibrium Fracture-Matrix Flow During Episodic Infiltration Events in Yucca Mountain" was prepared to be presented at the NRC-sponsored "Fifth Workshop of Flow and Transport through Unsaturated, Fractured Rock -- Related to High Level Radioactive Waste Disposal" at the University of Arizona on January 7-10. A second paper by T. Buscheck entitled

"Modeling Hydrothermal Flow in Variably Saturated, Fractured, Welded Tuff During the PEBSFT of the Yucca Mountain Project" will also be presented.

A paper by D. Wilder entitled "Yucca Mountain Near Field Environment Considerations for Engineered Barrier System Design and Performance" completed the technical review process and was submitted for the IHLRWM Conference in Las Vegas in April 1991.

A paper by J. Nitao entitled "Theory of Matrix and Fracture Flow Regimes in Unsaturated, Fractured Porous Media" completed the technical review process and was submitted for the IHLRWM Conference in Las Vegas in April 1991.

A paper by W. Lin entitled "Variation of Permeability with Temperature in Fractured Topopah Spring Tuff Samples" was submitted for the IHLRWM Conference in Las Vegas in April 1991.

A paper by W. Lin and W. Daily entitled "Laboratory Determined Suction Potential of Topopah Spring Tuff at High Temperature" was submitted for the IHLRWM Conference in Las Vegas in April 1991.

#### Mechanical Attributes of the Waste Package Environment

Continued to revise the Study Plan for Characterization of Mechanical Attributes of the Waste Package Environment (Study Plan 8.3.4.2.4.3) incorporating the review comments received.

Staff attended the American Geophysical Union (AGU) seminar in San Francisco, December 3-7.

#### EBS Field Tests/ESF Test Design

A paper by V. Latorre entitled "Microwave Measurements of the Water Content of Bentonite" was reviewed and submitted to YMPO for the IHLRWM Conference in Las Vegas in April 1991.

D. Wilder and W. Lin attended a meeting of the Exploratory Shaft Test Coordination (ESTC) on December 18.

#### **1.2.2.3 Waste Form and Materials Testing**

##### Waste Form Testing - Spent fuel

The drybaths continued to run without incident. They were shut down on December 20th for the holiday season. A weighing is scheduled following the holiday.

A hot cell flow-through test column containing individual grains and subgrains of ATM-106 spent fuel (8% fission gas release, 43 MWd/kgM burnup) was transferred from the Performance Assessment Scientific Support (PASS) program to the LLNL-YMP program on November 6. Matrix dissolution rates in deionized water have

been measured in this column for 182 days under the PASS program. The water was changed to 171  $\mu\text{g/mL}$   $\text{NaHC0}_3$  solution as an initial experiment to evaluate the effects of water chemistry on matrix dissolution rates with actual spent fuel. As expected, the dissolution rate increased when the water was changed, but the increase (a factor of roughly four) appears to be only about half that expected based on earlier work with unirradiated  $\text{UO}_2$ . However, the reported increase is quite uncertain at this time because the observed dissolution rate has been very erratic.

In anticipation of additional flow-through tests with spent fuel, the MCC has been requested to provide a section of fuel rod from ATM-103 (0.25% fission gas release, 30 MWd/kgM burnup). Delivery of the fuel is expected during the first part of January 1991. Some of this fuel may be used in the screening tests. When a method for eliminating particles small enough to potentially pass through the 2- $\mu\text{m}$  frits has been developed, flow-through testing of spent fuel for the LLNL-YMP program will be restarted.

Work continued on calculating the effect of uraninite oxidation and dissolution (as uranyl ion,  $\text{UO}_2^{2+}$ ) on the buffer capacity of bicarbonate/carbonate and acetic acid/acetate buffers.

K. Notz of ORNL visited LLNL on December 13 to discuss the ORNL Database for Waste Form Characterization.

H. Leider visited PNL on December 3 for talks on dissolution.

#### Waste Form Testing - Glass

The N2 tests (SRL actinide-doped glass) continued as scheduled with no sampling period occurring this month. These tests have now been in progress for 262 weeks.

The N3 tests (ATM-10, a West Valley actinide-doped glass) were continued as scheduled. The tests have been in progress for 174 weeks.

Development work has continued with solutions from the N3 tests to examine the particular material in solution and the distribution of actinides. A second filtering sequence was conducted using filter sizes ranging from 1  $\mu\text{m}$  to  $\sim 18 \text{ \AA}$ . As with the first filtering series,  $\sim 80\%$  of the Np passed through all of the filters while  $\sim 100\%$  of the Am/Pu was trapped on the 1  $\mu\text{m}$  filter.

Work continues on Section 5.5.1, Glass Species Composition Statistics, and Section 5.5.2, Glass Fracture (Fragmentation Statistics), of the Waste Form Characterization Report. Work on Section 6, Repository Waste Form Response will continue when further guidance is received.

The presentation by J. Bates and W. Ebert entitled "The Importance of Secondary Phases in Glass Corrosion" was made at the Materials Research Society meeting.

The paper by J. Bates entitled "Mechanistic Interpretation of Glass Reaction: Input to Kinetic Model Development" was submitted to the IHLRWM Conference in Las Vegas in April 1991.

The Task Plan by J. Bates entitled "YMP Static Leach Tests", controlling the long-term static leach testing of DWPF glass has been revised and is undergoing internal review.

Five Task Plans have been returned to ANL from YMP-LLNL with comments. These comments are being addressed and the Task Plans will be resubmitted.

#### Container Materials Modeling and Testing

Work continues on data reduction, analyses, and presentation from a series of electrochemical polarization curves obtained on Alloy 825 in solutions of NaCl and Na<sub>2</sub>SO<sub>4</sub> at different temperatures and pH values. Plans have been formulated for extending the work to include additional environmental variables.

Work by D. Reed at ANL is concerned with the gamma radiation effects on changing the chemical environment around the waste package and the subsequent effects of these changes on the performance of the container. In FY91, the emphasis of the radiation effects work at ANL consists of the following "tasks" (ANL designation):

- 1) Yield of NO<sub>x</sub>/NH<sub>3</sub> in high water vapor air systems.
- 2) Modeling/calculation of radiolytic yields in the waste package.

The modeling work (task 1) has been initiated and is on schedule. Experimental work on ammonia and condensable NO<sub>x</sub> yields (task 2) in high water vapor to air ratios is scheduled to begin in January 1991. This will complete the long-term yield studies initiated three years ago.

Efforts continue on improving stochastic models. The generation of uniformly random variables lies at the heart of Monte Carlo calculations so that use of a reliable random number generator is key. Discussions were held between G. Henshall (Metal Barrier Task) and W. O'Connell (Performance Assessment Task) to identify several suitable routines. Two quantitative results from one stochastic model are the induction time, which is the amount of time elapsed before the first stable pit forms, and the number of pits produced in a given amount of time. Considerable effort has been spent in developing a computer program that correctly makes Monte Carlo calculations based on this stochastic model and then analyzes the results so that a survival probability plot can be quickly constructed.

As requested by the Congressional House Appropriations Committee, information was transmitted to DOE/HQ and to YMPO on waste package activities involving deep drawing as a possible container fabrication process. This request was a deliverable mandated by the FY-91 budget appropriation for the Yucca Mountain Project.

The paper by D. McCright entitled "Container Materials for the Proposed Yucca Mountain Repository", presented orally at the Materials Research Society (MRS) meeting in Boston, MA in November; was approved for publication by YMPO.

The paper by D. Reed and R. Van Konynenburg entitled "Corrosion of Copper-Based Materials in Irradiated Moist Air Systems" was accepted for publication in the proceedings of the MRS conference that was held in Boston in November.

The paper by G. Gdowski and D. McCright entitled "Degradation Mode Surveys of High Performance Candidate Container Materials" and the paper by D. McCright and D. Fleming entitled "An Electrochemical Approach to Predicting the Corrosion Performance of Container Materials" were prepared, reviewed and approved by YMPO for presentation at IHLRWM Conference in Las Vegas, NV in April.

A paper by R. Van Konynenburg entitled "Effect of Ionizing Radiation on the Waste Package Environment" was prepared, reviewed and approved by YMPO for the IHLRWM Conference.

D. McCright attended a DOE Technical Review Group (TRG) meeting in Richland, WA on December 5-6. The purpose of the meeting was to discuss and consolidate comments made on portions of the Waste Qualification Reports (WQR) being prepared by glass waste form producers: the Defense Waste Production Facility at Savannah River, SC and the West Valley Demonstration Project at West Valley, NY. The TRG members also toured the hot cell facilities at Westinghouse Hanford where some high level waste is being characterized for the Hanford Waste Vitrification Project, a future waste form producer.

D. McCright met with the LLNL-YMP Software Quality Manager on December 18 to discuss planned software activities in the Metal Barrier Task.

W. Clarke attended a PACS training session on December 21. The project networks are being revised to correspond with the Waste Package Plan. It appears that work in the Metal Barrier Task/Container Materials Technical Area is in accord with the planning documents and PACS.

#### Integrated Radionuclide Release

Completed electron probe characterization of a banded chert sample (analogue) prior to analysis for rare earth element concentration gradients.

Generated files and plots of concentration vs. depth profiles for actinide distributions in tuff wafers and cup samples.

Recalculated all processed SIMS data with revised standard values.

Continued testing, shakedown, and development of a new software package for the electron probe.

Completed a draft Individual Software Plan for the CAMECA 3F ion microscope data acquisition. Worked on software necessary to calculate relative sensitivity factors (RSF) for the ion microscope from standards created via ion implantation.

Visited the core repository at NTS and inspected available core. A second request for core samples was sent to U. Clanton on December 26th.

Received the remaining parts that had been ordered for the flow-through chemical-hydrological system, including the pressure vessel.

Prepared and submitted the final abstract of a poster by M. Buchholtz ten Brink, et al., entitled "Heterogeneities in Radionuclide Transport: Pore-Size, Particle-Size, and Sorption" for the Concepts in Manipulation of Groundwater Colloids for Environmental Restoration meeting that was held in Manteo, NC, October 15-18, 1990.

Prepared and submitted the final paper by M. Buchholtz ten Brink, et al., entitled "Actinide Transport in Topopah Spring Tuff: Pore Size, Particle Size and Diffusion" for the Materials Research Society (MRS) Symposia, Scientific Basis for Nuclear Waste Management XIII, Boston, MA, November 26-29, 1990.

Prepared and submitted the final paper by D. Smith entitled "Mineralogical, Textural and Compositional Data on the Alteration of Basaltic Glass from Kiluea, Hawaii to >300°C: Insights to the Corrosion of a Borosilicate Glass Waste Form" for the MRS Symposia, Boston, MA, November 26-29, 1990.

Staff attended the American Geophysical Union (AGU) fall meeting sessions in hydrology, natural analogues, hydrothermal systems, particle transport, geochemistry, and others.

Presented the paper by M. Buchholtz Brink, et al., entitled "Characterization and Transport of Colloidal Particles in Groundwaters from the Nevada Test Site" at the AGU fall meeting in San Francisco, December 3-7, 1990.

Prepared and submitted the final paper by M. Buchholtz ten Brink, et al., entitled "Effects of Heterogeneity on Actinide Diffusion Rates in Tuffaceous Rock" for the IHLRWM conference in Las Vegas, NV, April 1991.

#### Thermodynamic Data Determination

Data reduction began on the praseodymium acetate spectra collected at elevated temperatures. Baseline normalization of each spectrum was performed with SPECTRA CALC, while SQUAD was used to calculate the first and second stability constants via matrix regression analysis.

#### 1.2.2.4 Design, Fabrication, and Prototype Testing

##### Waste Package Design

Staff members worked on determining the formal process to be used to generate and evaluate alternate Engineered Barrier System (EBS) designs.

## Container Fabrication and Closure Development

The boxes received from Babcock & Wilcox (B&W) in December were shipped to Camp Parks (Dublin, CA) for temporary storage because of space limitations on the LLNL site. Eventually, some of the material may be microstructurally characterized, perhaps as part of Metal Barrier SIP Activities E-20-18 or E-20-24.

## Container/Waste Package Interface Analysis

A draft set of EBS Mission Requirements was prepared.

## **1.2.5 REGULATORY AND INSTITUTIONAL**

### NRC Interaction Support

Staff participated in the NRC/DOE Technical Exchange on Total Systems at SNL during the first week of the month.

L. Jardine, R. Stout and J. Bates from ANL attended a dry run meeting in Las Vegas on December 12 to prepare for the briefing to J. Matuzak on December 20. L. Jardine, W. Bourcier and R. Stout attended a meeting on glass waste form and the engineered barrier with J. Matuzak in Washington at DOE-HQs on December 20. These activities are in support of a National Academy of Science interaction.

### Site Characterization Program

L. Ballou attended the Test Prioritization Meeting in Palo Alto, December 11-13.

Work on addressing the SCP comments from the State of Nevada continued.

### Technical Support Documentation

No significant activities.

### Study Plan Coordination

Technical reviews were completed for the USGS Study Plan 8.3.1.17.3.5 "Ground Motion at the Site from Controlling Seismic Events" and the SNL Study Plan 8.3.1.15.1.8 "In Situ Design Verification".

Reviewer concurrence was completed for technical comments on SNL Study Plan 8.3.1.15.1.3 "Laboratory Determination of Mechanical Properties of Intact Rock".

### Semi-Annual Progress Reports

Review of the draft Third Technical Status Report (TSR) was completed.

## **1.2.9 PROJECT MANAGEMENT**

### **1.2.9.1 Management**

Technical presentations were given at LLNL staff meetings:

December 3 - R. Thatcher discussed Controlled Sampling Methodology

December 17 - J. Nitao discussed V-TOUGH code development and future plans.

At the end of December, five of the nine LLNL-YMP QA grading reports had been accepted by the YMPO QRB. LLNL-YMP management and QA personnel have worked closely with the QRB to facilitate completion of the grading process.

The TPO discussed the LLNL FY91 budget allocations and proposed revisions with C. Gertz and his staff on December 13.

LLNL-YMP informally reviewed the YMPO Software Plan. A comment resolution meeting was scheduled with D. Helton of YMPO.

### **1.2.9.2 Project Control**

LLNL was audited as a part of the Nuclear Waste Fund audit conducted by the CPA firm of KPMG Peat Marwick. No findings were reported.

LLNL was audited as a part of the YMP audit conducted by the DOE Office of the Inspector General. No findings were reported within the financial compliance or procedures areas.

Revised the responsibility for monitoring and approving all charges on each YMP account to specific YMP staff members. This revision brings account responsibility in line with technical responsibilities.

Modifying the account structure within the LLNL financial system to budget and collect costs as required by the YMP cost/schedule control system.

Submitted the November FTE Report and Cost Plan to YMPO.

Prepared a list of equipment purchased by the Nuclear Waste Fund and submitted the list to YMPO.

Continued to work on the update of the Information Technology Resources Long Range Plan.

Continued to update the PACS network data.

### **1.2.9.3 Quality Assurance**

The LLNL-YMP Quality Assurance Manager position transition has been completed. R. K. (Bob) Dann became LLNL-YMP QA Manager, effective December 21, 1990.

Conducted QA Audit 91-01, LLNL-YMP Instrument Calibration Program on December 10-11, 1990.

Transmitted to YMPO Audit Report LLNL-91-11, "Babcock & Wilcox" (related materials physically located at LLNL).

Transmitted to YMPO Nonconformance Reports LLNL-048, LLNL-058, and LLNL-061. These NCRs have now been completed and verified.

Conducted a follow-up review of the results from a previously conducted audit at Tektronix, Inc. in Portland, OR on December 13-14.

Transmitted to YMPO a signed Interface Memorandum of Understanding, Document Control Number 660003, Rev. 1, Draft C, "SDRD Data to be Verified (Responsibility Matrix)".

Conducted an internal QA grading review meeting for Activity D-20-53a, "Flow-through Dissolution Tests".

D. Wilder and D. Short attended the QA briefing for C. Gertz and J. Bartlett in Las Vegas on December 6.

Two staff members attended a QRB Meeting in Las Vegas on December 5-6.

**LLNL PROJECT STATUS REPORT DISTRIBUTION**

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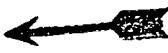
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Enclosure 3 (2 of 2)



# Lawrence Livermore National Laboratory

LLYMP9101196  
February 5, 1991

WBS 1.2.9  
"QA: N/A"

Carl Gertz, Project Manager  
Department of Energy  
Yucca Mountain Project Office  
P.O. Box 98518  
Las Vegas, Nevada 89193-8518

## SUBJECT: Yucca Mountain Project Status Report - January 1991

Attached is the January Project Status Report for LLNL's participation in the Yucca Mountain Project.

If further information is required, please contact Elizabeth Campbell of my staff at FTS 532-7854.

Sincerely,

A handwritten signature in black ink, appearing to read "Leslie Jardine".  
\_\_\_\_\_  
Leslie Jardine  
LLNL Technical Project Officer  
for YMP

LJJ/EC/ec

cc:  
Distribution

## DISCLAIMER

The LLNL Yucca Mountain Project cautions that any information is preliminary and subject to change as further analyses are performed or as an enlarged and perhaps more representative data base is accumulated. These data and interpretations should be used accordingly.

LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT  
MONTHLY TECHNICAL HIGHLIGHTS AND STATUS REPORT  
JANUARY 1991  
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LAWRENCE LIVERMORE NATIONAL LABORATORY  
(LLNL)  
YUCCA MOUNTAIN PROJECT (YMP) STATUS REPORT

JANUARY 1991

**1.2.1 SYSTEMS**

**1.2.1.1 Management and Integration**

LLNL participated in the scoping meeting for the Early Evaluation of Site Suitability in Las Vegas January 15-17 and has lead responsibility for the Rock Characteristics Postclosure Geotechnical Guideline.

A technical staff member from the Geochemical Database Task participated in the Software QA Workshop in Las Vegas on January 23-24.

**1.2.1.2.4 Systems Engineering Implementation**

Staff (Core Team Member and Technical Experts) attended the Physical System Functional Analysis Task January 7-18 in Las Vegas. LLNL technical experts supported the development/decomposition of the "Handle Waste" and "Isolate Waste" functions.

Review of the Technical Data Submittal from C. Wilson's PNL solubility data (upper-limit, steady-state concentrations) was completed. The resulting data package and associated Technical Data Information Forms were forwarded to SNL for inclusion in the Site & Engineering Properties Database.

Staff participated in the Technical Data Advisory Group meeting in Las Vegas on January 17 and presented a briefing on the status of the EQ3/6 element of the Technical Database.

**1.2.1.4.2 Waste Package Performance Assessment**

Staff reviewed the paper by W. O'Connell entitled "Preliminary Calculations of Release Rates from Spent Fuel in a Tuff Repository" which was submitted to the International High Level Radioactive Waste Management (IHLRWM) Conference to be held in Las Vegas in April.

Staff participated in the Site Suitability discussions at LBL, January 29-31. Issues discussed included expected flow processes, human intrusion problem description, and source term module for total systems performance assessment.

**1.2.1.4.5 Geochemical Modeling and Database Development**

This task is now focused on the completion of software documentation, a package consisting of the EQ6, EQ3NR, and EQPT user's guide. The draft EQ6 user's guide is being revised to satisfy "internal" review comments, including those made by P. Cloke of SAIC, and to bring it up to date so as to match the recent code release

(EQ3/6, Version 3245.1090). The draft version of the EQPT user's guide is being checked for consistency with the final code release before being submitted for internal review. A draft of revision 1 of the EQ3NR user's guide (1983), is also being prepared.

All of the sample problems in the EQ6 and EQ3NR documents have been updated as needed and re-run using the latest versions of the code and data files.

Code maintenance has been terminated and the software frozen due to lack of budget.

Continued development of a software interface between the GEMBOCHS database and the (gt) geochemical modeling code. This project involves collaboration with the Glass Waste Form Task.

Generated revised DATA0 suites R8 and R9 which support the EQ3/6 Version 3425.1090 package. Relative to R7, R8 incorporates corrected dissociation constants for five aqueous species. Relative to R8, R9 provides commented-out ion size parameter and molecular weight fields within individual species blocks. These blocks will be needed to run the gt code.

Staff completed a second technical review of the paper by J. Delany and S. Lundeen entitled "The LLNL Thermochemical Database and Revised Data and File Format for the EQ3/6 package".

## 1.2.2 WASTE PACKAGE

### 1.2.2.1 Management and Integration

A data package on the solubility of radionuclides in J-13 water was prepared, reviewed, and submitted to the Site and Engineering Properties Database (SEPDB).

A staff member from the Hydrology Task participated in the Software QA Workshop in Las Vegas on January 23-24.

A Change Request is being prepared for submission to the YMP Change Control Board to create a new WBS element within the Waste Package Environment task for the studies of the Man-Made Materials Task.

### 1.2.2.2 Waste Package Environment

#### Chemical and Mineralogical Properties of the Waste Package Environment

X-ray diffraction (XRD) analyses have been completed on the reacted tuff water samples and secondary minerals that precipitated directly from solution from the last two hydrothermal interaction experiments. The wafers were analyzed prior to breaking them to prepare electron microprobe cross-section mounts. Plots were completed of the final aqueous phase chemistry data and the solution model EQ3/6 calculations (speciation/solubility and in situ pH).

Time was spent regaining the capability to model glass/water interaction using EQ3/6 and modeling the hydrothermal experiments done in support of the Glass Waste Form Task. The completed Tpt vitric tuff hydrothermal experiments can now be modeled using the results from dissolution kinetics measurements made on a simple glass as a guide to an appropriate dissolution rate for Tpt glass. Full reaction progress calculations using kinetics will be made.

Work continued on preparing a draft of the Near Field Environment Report and reviewing the geochemistry section.

Work continued on preparing an UCID report with the preliminary title "Progress in Modeling Fluid-Rock Interaction at Yucca Mountain, Nevada". The UCID details the development of solid-solution and cation-exchange models for clinoptilolite, which is a highly sorptive phase at Yucca Mountain, and includes comparisons of model predictions with laboratory and field data.

C. Wittwer gave a presentation to the Near Field Environment Technical Area meeting on January 18. She is searching existing literature on colloids formed by man-made materials in the near field environment.

W. Glassley, Geochemistry Task Leader, will be on a sabbatical leave to Australia until January 1992. During his absence, the Task will be covered by several Principal Investigators and the Near Field Technical Area Leader.

#### Hydrologic Properties of the Waste Package Environment

The fracture healing study is continuing. Results indicate that flowing steam through a naturally fractured tuff sample may cause fracture healing similar to that of flowing water at temperatures above 90°C. However, the steam that flowed through the sample was not collected for chemical analyses. Therefore, the mechanism of steam-rock interaction could not be determined. Water from the condensed steam that flowed through the sample was collected. This water will be analyzed using an ICP technique. The tuff sample is now undergoing post-steam drying. When the sample is dry, the gas permeability will be measured again. The permeability values before and after flowing steam will be compared.

Work started on analyzing one-dimensional matrix-dominated flow through the entire hydrostratigraphic column from the ground surface to the water table.

V-TOUGH has been enhanced to include the capability of accommodating time-dependent Dirichlet boundary conditions. Staff members are currently developing an Individual Software (QA) Plan for V-TOUGH and are exploring various options in light of current personal limitations. The first draft has been completed of the software requirements document (SRS) for an extensive enhancement to the software which is used to post-process V-TOUGH output. Revisions are currently being made in response to comments provided by code users.

A revision was completed for the chapter of the Near Field Environment Report dealing with laboratory studies of the hydrological properties of the near field.

Analyzed and summarized relatively recent work on the fracture-matrix model work. Scoping calculations which have been conducted for the EBSFT as well as equivalent continuum model scoping calculations which have been conducted for the vertical PEBSFT are included in the chapter.

Work continues on the Study Plan for the Near Field Hydrology Task.

Staff participated in the University of California Nuclear Engineering Department monthly meeting on January 16. LLNL-YMP work was presented on nonequilibrium fracture-matrix flow. Discussions included the possibility of collaborating on research topics of mutual interest.

Staff attended the first meeting of the Hydrology Integration Task Force in Las Vegas on January 31.

#### Mechanical Attributes of the Waste Package Environment

Continued to revise the Study Plan for Characterization of Mechanical Attributes of the Waste Package Environment (Study Plan 8.3.4.2.4.3) incorporating the review comments received.

A revision was completed for the input to the Near Field Environment report.

#### EBS Field Tests/ESF Test Design

The report by A. Ramirez, et. al., entitled "Prototype Engineered Barrier System Field Tests (PEBSFT) - Final Report" is in its final revision before being sent to YMPO.

The report by N. Mao entitled "Thermocouple Psychrometer Measurements of In Situ Water Potential Changes in Heated, Welded Tuff" has completed technical review and will soon be sent to YMPO.

#### **1.2.2.3 Waste Form and Materials Testing**

##### Waste Form Testing - Spent fuel

A description of the spent fuel dissolution studies conducted over the last four years by the Performance Assessment Scientific Support (PASS) program at PNL, together with recommended future work, was presented at the Geologic Disposal Support Programs Overview Meeting held January 3 at PNL. This work will be integrated into the spent fuel studies planned by LLNL; and this integration will entail some change in work scope. A test plan is being prepared for approval by LLNL.

The first draft data for the Waste Form Characterization Report (WFCR) were submitted by staff to the Technical Area Leader and are being assembled in graphic file formats on hard disk to ease the editing of the WFCR and for later update additions to the report.

Readiness Review preparations for UO<sub>2</sub> Flow-Through Dissolution Testing D-20-53 were completed.

The Activity Plans D-20-44 and D-20-45 for oxidation testing were updated.

J. Bates of ANL visited LLNL on January 28 for discussions on the WFCR and Performance Assessment activities.

R. Einziger and L. Thomas visited LLNL on January 29 to discuss the future direction of the spent fuel oxidation program at PNL.

Staff visited PNL on January 3 for discussions on spent fuel waste form program plans.

Editing of PNL's proposed Test Plan for flow-through dissolution of spent fuel is underway.

#### Waste Form Testing - Glass

The results of a series of experiments indicate that when hydrated glass is exposed to moderate storage temperature (70°C) and high relative humidity (95%), water will condense on the glass surface and then drip from the glass. The concentrations of lithium and boron in the original glass are nearly equivalent, but the lithium concentration is much lower than the boron concentration in the collected water; therefore, lithium is apparently being incorporated into secondary phases.

A major portion of the effort this year will be in contributing to the WFCR. ANL will contribute to Sections 5.5.1, Glass Species Composition Statistics, and 5.5.2, Glass Fracture (Fragmentation Statistics). LLNL will supply the remainder of the sections. Work on these sections is in progress. In addition, ANL was requested to address the effects of radiolysis and to provide estimates of glass dissolution rates.

A new version of the geochemical modeling code (gt) was received from the University of Illinois. The problems with graphical output that occurred with the earlier version have been solved. Currently, the full graphics package is operating on the LLNL Alliant computer. A Sun-4 compatible version will soon be shipped which will function on LLNL Sun Sparc station computers, providing improved graphics performance and flexibility.

The computer programs SOLVEQ and CHILLER were obtained from Mark Reed at the University of Oregon. These are reaction path codes like EQ6 but are used mainly to model hydrothermal systems. CHILLER has the unique capability to model two-phase (boiling) systems. Both codes were ported to and are currently running on the Alliant computer.

Rick Russo gave a seminar on photo-thermal deflection spectroscopy at surfaces. The technique could be used to provide information on the changing composition of altered surface layers on glasses. Future work may use this technique.

### Quality Assurance

The reviews of the Test Plan to govern flow-through glass dissolution tests at LLNL are complete, and the document is currently being revised.

Three Task Plans have been revised at ANL and returned to LLNL for action. One Task Plan (Glass Waste Form) has been revised and returned for comment, but since EM rather than YMP is funding the work, no official action is required. The other two Task Plans will be revised when the activities are funded.

### Container Materials Modeling and Testing

W. Clarke attended a meeting in Las Vegas on January 16 on the preparations for the DOE Engineered Barrier System Workshop to be held in Denver on June 18-20.

D. Macdonald of SRI visited LLNL on January 31 to give a seminar on Life Extension Modeling.

The technical review for the degradation mode papers is in progress.

Continued working with PACS elements.

Working with ANL on work truncated in FY90. Restarting slow crack growth studies.

### Integrated Radionuclide Release

Input was provided for the Near Field Environment Report.

QA grading was completed for Activity G-20-2.

Collaboration work continued with LANL with discussions, document reviews and work plans for sorption and transport work.

SIMS analysis for rare earth element concentration gradients of banded chert sample (analogue) was completed.

Assembled database on accuracy and precision of microanalytical standard by electron microprobe analysis and began drafting report.

Continued preparing final data submission/records package of tuff wafer experiments.

Individual Software Plan for CAMECA 3F IMS data acquisition completed and in review. Continued development of software necessary for calibration of CAMECA to measure concentrations of trace elements in YMP samples.

The request for core material was approved by SOC.

Began construction of the flow-through chemical-hydrological experimental system. Laboratory space was obtained for the critical point dryer and installation has began. Supplies were received for autoradiography and for the determination of three dimensional pore structure and set-up has begun. Laboratory space has been acquired and renovations begun for the installation of the auto-correlation photon spectrometer.

Began writing manuscript on identification of actinide-bearing colloids in waste glass with J. Bates (ANL).

#### Thermodynamic Data Determination

Data analysis of the praseodymium acetate system was completed, and final stability constants for the first and second complexes were obtained at five temperatures between 20–95°C.

The carbonate complexation measurements of uranium (IV) was completed in January as a deliverable.

#### **1.2.2.4 Design, Fabrication, and Prototype Testing**

##### Waste Package Design

A designer has been added to support the Waste Package Design Task.

##### Container Fabrication and Closure Development

No significant activities.

##### Container/Waste Package Interface Analysis

No significant activities.

#### **1.2.5 REGULATORY AND INSTITUTIONAL**

##### NRC Interaction Support

No significant activities.

##### Site Characterization Program

Work on addressing the SCP comments from the State of Nevada continued.

##### Technical Support Documentation

No significant activities.

### Study Plan Coordination

Technical review of SNL Study Plan 8.3.1.15.1.8 "In Situ Design Verification" was completed on January 8.

### Semi-Annual Progress Reports

No significant activities.

## 1.2.9 PROJECT MANAGEMENT

### 1.2.9.1 Management

All nine of LLNL-YMP QA grading reports (QAGRs) have been accepted by the QRB. Transition to the new system is complete. A detailed list of activities and the associated QAGRs is being prepared as a transition report to YMPO. LLNL-YMP activities are controlled using the QA criteria specified in the QAGRs. Detailed QA procedures are specified by internal QA grading packages that are at least as restrictive as the QRB-accepted QAGRs. Updating of these packages is underway.

A Technical presentation was given at an LLNL-YMP staff meeting:  
January 7 - D. McCright discussed the Metal Barrier Task work.

LLNL staff met with representatives from SAIC and the Integrated Resources Group to examine backlogged records and to determine the types of records that should be entered into the Records Information System (RIS) and the Licensing Support System (LSS).

The TPO and four staff members participated in the Software QA Workshop in Las Vegas on January 23-24.

The TPO attended the NWTRB meeting on January 16-17 in Washington, D.C.

The TPO attended an EPRI workshop on January 8-9 in Palo Alto, CA. The workshop discussed actinide burning and partitioning.

The TPO attended a course on Total Quality Management on January 25-27.

The carbonate complexation measurements of uranium (IV) was completed in January as a deliverable.

### 1.2.9.2 Project Control

Submitted the quarterly Worker Data Report to YMPO. The December FTE and Cost Plan Reports were also submitted to YMPO.

Completed an update of LLNL-YMP input to the Information Technology Resources Long Range Plan.

Completed PACs network updates for FY91 plan modifications. Modifications were made to 14 P&S Accounts which now contain a total of 65 Summary Accounts.

Revised the Spending Plan to support new FY91 LLNL budgets.

#### **1.2.9.3 Quality Assurance**

The Tektronix, Inc. facilities at LLNL and at Beaverton, Oregon were surveyed to determine the degree of resolution of identified Audit Findings as well as other observations and comments resulting from previous audits.

Work is continuing on the internal transition from QA Levels to QA Grading. This transition includes updating QPs and the QAPP.

Conducted internal QA grading review meetings for:

- 1) Activity G-20-2, "Determination of Elemental Profiles in Rocks, Minerals, and Glasses Using Ion Microscope"
- 2) Activity B-20-20, "Preliminary Code Development"; and
- 3) Activity J-20-8.1, ""Actinide and Technetium Thermodynamic Measurements".

Transmitted to YMPO QA Audit Report 91-01, "LLNL-YMP Instrument Calibration Program".

Transmitted to YMPO Nonconformance Reports LLNL-030, LLNL-031, LLNL-032, LLNL-033, LLNL-039, LLNL-055, LLNL-056, and LLNL-057. These NCRs have now been completed and verified.

The QA Manager participated in the Software QA Workshop in Las Vegas on January 23-24.

**LLNL PROJECT STATUS REPORT DISTRIBUTION**

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