LAWRENCE LIVERMORE NATIONAL LABORATORY YUCCA MOUNTAIN PROJECT

NOVEMBER 1992 TECHNICAL HIGHLIGHTS AND STATUS REPORT

TABLE OF CONTENTS

9302220435 930203
PDR WASTE
WM-11 PDR

1.2.9 Project Management

WBS 1.2.9.1	Management and Coordination (Clarke)
WBS 1.2.9.1.2	Technical Project Office Management (Clarke)
WBS 1.2.9.2	Project Control (Podobnik)
WBS 1.2.9.2.2	Technical Project Office Management (Podobnik)

1.2.11 Quality Assurance

WBS 1.2.11.1	Quality Assurance Coordination and Planning (Wolfe)
WBS 1.2.11.2	Quality Assurance Program Development (Wolfe)
WBS 1.2.11.3	Quality Assurance Verification (Wolfe)
WBS 1.2.11.3.1	Quality Assurance Verification - Audits (Wolfe)
WBS 1.2.11.3.2	Quality Assurance Verification - Surveillance (Wolfe)
WBS 1.2.11.5	Quality Assurance - Quality Engineering (Wolfe)

1.2.12 Information Management

WBS 1.2.12.2.2	Local Records Center Operation (LRC) (Bryan)
WBS 1.2.12.2.5	Document Control (Bryan)

1.2.13 Environment, Safety and Health

WBS 1.2.13.1	Environment, Safety and Health Coordination and Planning (Blink)

1.2.15 Support Services

WBS 1.2.15.2	Administrative Support (Campbell)
WBS 1.2.15.3	YMSCP Support for the Training Mission (Bryan)

LAWRENCE LIVERMORE NATIONAL LABORATORY
(LLNL)
YUCCA MOUNTAIN PROJECT (YMP) STATUS REPORT

NOVEMBER 1992

EXECUTIVE SUMMARY
(Items Proposed for Reporting in YMPO or OGD Reports)

1) **1.2.2.2.1 (Chemical and Mineralogical Properties of the Waste Package Environment).** LLNL staff worked with YMPO and LANL representatives to establish the collaborative activities necessary to address issues regarding flow, transport, rock-fluid interaction, and mineral stability. A better understanding of roles and efforts was developed from these consultations.

2) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** J. Nitao is currently testing a prototype version of the NUFT code (Nonisothermal Unsaturated Flow and Transport) for nonisothermal radionuclide transport problems. NUFT, which can handle multi-phase heat flow and aqueous-phase multiple species transport, was primarily developed outside of YMP. J. Nitao sent a description of NUFT to J. Duguid, M&O/INTERA, so that it could be included in the M&O report "Review and Selection of Unsaturated Flow Models".

3) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** At the request of the M&O, repository scale (including the saturated zone) hydrothermal calculations were conducted at Areal Power Densities of 20 and 114 kW/acre and for burnups of 21, 26, and 30 yrs (corresponding to Youngest Fuel First-YFF, Oldest Fuel First-OFF, and reference cases). For the 20 kW/acre cases, peak temperatures are similar (55-60°C), but the time of peak temperature varies from 150 to 729 yr. Most of the temperature buildup occurs during the first 100 yr in each case; this time is too short to smooth package-to-package and drift-to-drift temperature profiles, and hence the actual peak temperatures would be higher. For the 114 kW/acre cases, the peak temperature ranges from 178 to 203°C at times between 122 and 602 yr; again, most of the temperature buildup occurs in the first 100 yrs. For these 114 kW/acre cases, the duration of boiling ranges from 7331 to 11,450 yr; these times are long enough to smooth local temperature variations.

4) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** Hydrothermal calculations which include the saturated zone (SZ) have been conducted for the SCP-CDR reference case of 57 kW/acre, 10 yr old spent fuel with burnup of 33,000 MWd/MTIHM. The repository horizon peak temperature is 100.3°C at 95 yr and the time above boiling is 666 yr. These results are similar to those which consider the SZ surface to be isothermal (peak temperature of 100.0°C at 94 yr, and boiling for 553 yr). The peak water table temperature rise of 30°C occurs at 4140 yr, with no temperature rise in the first 500 yr and most of the increase occurring between 1000 and 2000 yr. At 20,000 yr, the water table heating is still 20°C, and the temperature rise one third of the way into the nonwelded zeolitized Calico Hills unit is 21°C (its maximum of 45°C occurs at 1635 yr). These calculations also show that, for vertically connected fractures, condensate drainage can persist all the way to the water table.

5) **1.2.2.2.2 (Hydrologic Properties of the Waste Package Environment).** Hydrothermal calculations which include the saturated zone (SZ) show that the SZ heating is a function of the quantity of spent fuel emplaced rather than the geometric design details of its emplacement. Consequently, the hydrothermal and potential geochemical consequences of heat in the SZ should not be considered a design issue, but rather the inherent response of the SZ to the emplacement of a given quantity of spent nuclear fuel.

6) **1.2.2.3.2 (Metal Barriers).** At the American Society of Testing and Materials (ASTM) meeting in Miami, FL on November 16-18, container materials researchers from the NRC and the international community presented their results. The DOE community had no presentation due to lack of funding in this area last year. On the positive side, ANL presented data from 19,000 hrs of accelerated testing in J-13 water of Inconel 825, stainless steel 304 and stainless steel 316; these tests began under LLNL-YMP sponsorship and have continued using ANL internal funds. During the test, which is equivalent to 300 to 1000 years of service environment exposure, no environmentally-assisted cracks formed in the specimens. Another 35 months of testing would extend the equivalent service life exposure to 10,000 years. LLNL-YMP will probably resume funding these experiments this year.

1.2.1 SYSTEMS ENGINEERING

1.2.1.1 Systems Engineering Coordination and Planning

No significant activities.

1.2.1.5 Special Studies

No significant activities.

1.2.1.6 Configuration Management

LLNL-YMP reviewed its controlled documents to determine the impact of CR 92/140, CR 93/044, CR93/048 and CR93/053 and found that no LLNL-controlled documents were affected.

1.2.2 WASTE PACKAGE

1.2.2.1 Waste Package Coordination and Planning

R. Dyer, A. Simmons and J. Boak (YMPO) visited LLNL on November 13 to discuss coupling of geochemistry and hydrology.

D. Wilder attended the cost reduction meeting held in Las Vegas on November 6. This team is examining all aspects of the Testing Programs to find ways to reduce costs.

B. Viani participated in the November Geochemical Integration Team (GIT) meeting held by teleconference.

1.2.2.2 Waste Package Environment

Work was done to resolve comments on the Preliminary Near Field Environment Report.

1.2.2.2.1 Chemical and Mineralogical Properties of the Waste Package Environment

Activities related to definition of equilibrium vs. non-equilibrium domains continued. The possibility of using standard computational packages to undertake simple models of rock-fluid interaction, and how these interactions may influence hydrological properties is being explored. The possibility that cellular automata may be useful is being evaluated.

Final justifications for sole source of the New Zealand contract were nearly completed. Minor delays in getting appropriate documents from the New Zealand participants are being addressed.

LLNL staff worked with YMPO and LANL representatives to establish the collaborative activities necessary to address issues regarding flow, transport, rock-fluid interaction, and mineral stability. A better understanding of roles and efforts was developed from these consultations.

A paper by K. Ragnarsdottir (Bristol University) entitled "Dissolution Kinetics of Heulandite at pH 2-12 and 25°C" was approved by YMPO. This paper was submitted to Geochimica Cosmochimica Acta.

A paper by W. Glassley entitled "Validation of Hydrogeochemical Codes Using the New Zealand Geothermal System" has been submitted for internal review.

1.2.2.2.2 Hydrologic Properties of the Waste Package Environment

The first draft of a Study Plan for the laboratory experiment portion of the Near Field Environment Hydrology is almost complete. It will be available for editing next month.

Model Calculations

Work continued conducting and analyzing the preliminary scoping calculations of the hydrothermal performance of the repository, using the RIB Version 4 thermal conductivity data, and using the new model which represents hydrothermal flow in the upper 1000 m of the saturated zone (SZ) as well as within the unsaturated zone (UZ). All of the prior repository-scale and drift-scale hydrothermal calculations have considered 10, 30, and 60-yr-old spent nuclear fuel (SNF) having the reference SCP-CDR burnup of 33,000 megaWatt-days per metric ton of heavy initial metal (MWd). At the request of the M&O, repository-UZ-SZ scale hydrothermal calculations for SNF have been conducted with other average ages and burnups. This request was made in order to investigate the hydrothermal performance of the repository-UZ-SZ system under thermal loads which are more specifically tied to potential SNF selection options for the MGDS. As previously reported, the repository-UZ-SZ scale model does not represent the details of the emplacement

geometry or schedule; instead it averages the thermal loading over a 4.6-m-thick disk having a diameter which corresponds to the repository area being modeled. Two extreme SNF selection scenarios were considered with the "oldest fuel first" (OFF) scenario yielding an average fuel age and burnup of 26 years and 39,585 MWd and the "youngest fuel first" (YFF) scenario yielding an average fuel age of 21 years and burnup of 43,573 MWd. The 21-yr-old OFF and 26-yr-old YFF scenarios were considered for Areal Power Densities (APDs) of 20 and 114 kW/acre.

For the 20 kW/acre cases, a 3162 acre repository was considered. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case, an APD of 20 kW/acre results in Areal Mass Loadings (AMLs) of 16.61, 20.43, and 27.14 MTU/acre, respectively. The 21-yr-old YFF scenario attains a peak average temperature at the repository center, T_{peak}, of 55.45°C at a time to peak temperature, t_{peak}, of 149.8 yr, while for the 26-yr-old OFF scenario, T_{peak} = 57.85°C at t_{peak} = 235.6 yr. For the 30-yr-old SNF reference case, T_{peak} = 59.94°C at t_{peak} = 729.4 yr. As has been previously observed, the time to peak temperature t_{peak}, increases with average SNF age. Although t_{peak} varies considerably among these three cases, there is very little substantive difference among the respective temperature profiles because most of the temperature buildup occurs during the first 100 years. For example, the 30-yr-old SNF case attains 94% of its ultimate temperature buildup during the first 100 years, with the temperature only increasing another 2.2°C between t = 100 and 729.4 yr. The 21-yr-old YFF and 26-yr-old OFF scenarios attain over 99% of their ultimate temperature buildup during the first 100 years. Therefore, although t_{peak} may appear to vary considerably, actual differences in repository temperature at any given time are relatively minor among the three 20 kW/acre cases.

It should be emphasized that T_{peak} is the peak averaged temperature at the repository center. Consequently, T_{peak} does not reflect temperature gradients between the emplacement drift wall (or emplacement borehole wall) and the pillar centers, nor does it reflect spatial temperature variations arising from the variability in the heat output among waste packages (WPs). Because peak temperatures are nearly attained in 100 years, thermal homogenization will not have had sufficient time to impact local peak temperatures within the repository. Therefore, actual distributions of peak temperature will deviate significantly from the values of T_{peak} given above. Depending on the number of fuel assemblies per WP and variations in the WP heat output, local boiling conditions can persist for hundreds of years even if average repository temperatures might appear to be indicative of sub-boiling conditions. If WPs contain more than 2 PWR fuel assemblies, local boiling conditions appear to be likely.

For the 114 kW/acre cases, a 559 acre repository was considered. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case, an APD of 114 kW/acre results in AMLs of 94.65, 116.45, and 154.7 MTU/acre, respectively. For the 21-yr-old YFF scenario, T_{peak} = 177.52°C at t_{peak} = 121.6 yr. For the 26-yr-old OFF scenario, T_{peak} = 188.2°C at t_{peak} = 453.6 yr. For the 30-yr-old SNF case, T_{peak} = 202.8°C at t_{peak} = 601.5 yr. Although t_{peak} varies considerably among these three cases, all three cases are effectively at their peak temperature within the first 100 years. For the 21-yr-old YFF and 26-yr-old OFF cases, over 99% of the temperature buildup occurs during the first 100 years, while 93.5% of the ultimate

temperature buildup occurs for the 30-yr-old SNF case during the first 100 years, with temperature only rising another 11.6°C between t = 100 and 601.5 yr.

For the three 114 kW/acre cases, the duration of the boiling period at the center of the repository, t_{bp}, is roughly linearly proportional to the AML. For the 21-yr-old YFF scenario, the 26-yr-old OFF scenario, and the 30-yr-old SNF reference case, t_{bp} is 7331, 9125, and 11,450 yr, respectively. Had these scenarios been run with the same AML (rather than the same APD), it is likely that t_{bp} would be similar for the three fuel ages with the 21-yr-old YFF case having the highest T_{peak}. Because of the relatively large t_{bp}, thermal homogenization with the repository will have occurred prior to the end of the boiling period. Therefore, spatial variability in heat output due to variations between WPs will not cause local values of t_{bp} to significantly deviate from average conditions.

The 10-yr-old SNF, 57 kW/acre, 33,000 MWd reference burnup case (resulting in an AML of 49.21 kW/acre) was also considered; this is essentially the reference of SCP-CDR case. For the model which includes hydrothermal flow in the upper 1000 m of the SZ, T_{peak} = 100.3°C at t_{peak} = 94.6 yr, and t_{bp} = 666 yr. For comparison, the model which treats the water table as being at a fixed depth at a constant temperature calculates T_{peak} = 100.0°C at t_{peak} = 94.0 yr, and t_{bp} = 553 yr. The maximum temperature rise, ΔT_{max}, at the top of the SZ (225 m below the center of the repository) is 29.8°C occurring at t = 4140 yr. The temperature at the water table does not respond to repository heating for the first 500 yr, with most of the temperature rise occurring between t = 1000 and 2000 yr. At t = 20,000 yr, the temperature at the water table is still 19.7°C above ambient. Approximately one-third of the way into the nonwelded zeolitized Calico Hills (CHnz) unit (106.5 m below the center of the repository), ΔT_{max} = 45.4°C, occurring at t = 1635 yr. At t = 20,000 yr, the temperature at this location in the CHnz is still 21.1°C above ambient. Such a substantial, persistent increase in temperature has the potential for modifying the geochemical properties, thereby modifying the transport properties of potential pathways for radionuclide transport.

The calculations also show considerable condensate drainage below the repository. For vertically connected preferential fracture pathways, the calculations indicate that condensate drainage can persist all the way to the water table. Condensate drainage along fractures may also contribute to the alteration of transport properties below the repository.

Work continued on examining repository-heat-generated hydrothermal flow in the SZ for APDs ranging from 20 to 114 kW/acre. Last month it was reported that heatflow in the SZ appeared to be dominated by heat conduction. This observation appears to hold for high APDs (i.e. sufficient to drive persistent boiling conditions at the repository) for t = <10,000 yr and for low APDs for t < 2000 yr. Convection begins to significantly affect SZ heatflow for t > 10,000 yr for high APDs and for t > 2000 yr for low APDs. The magnitude of repository-heat-driven buoyancy flow in the SZ was compared for three cases of 30-yr-old SNF having the same total mass of SNF: 1) 20 kW/acre over a repository area of 3162 acres, 2) 57 kW/acre over 1118 acres, and 3) 114 kW/acre over 559 acres. Although the geometric details of the convection cells differ, it was found that the overall magnitude of repository-heat-driven buoyancy flow is relatively insensitive to APD. For example, at t = 5000 yr, the

maximum horizontal fracture velocity, $(v_h)_{max}$ is 1182 m/yr for 20 kW/acre, 1513 m/yr for 57 kW/acre, and 1575 m/yr for 114 kW/acre. Although the APD varies by a factor of 5.7, the difference in $(v_h)_{max}$ is only 33% between these cases. Note that the SZ fluxes quoted last month are equivalent continuum flux, Q_{ECM}, which is different from the fracture velocities that are quoted this month. When there is a large contrast between fracture and matrix permeabilities, the fracture velocity can be obtained by multiplying Q_{ECM} by the ratio of the total (matrix + fracture) porosity divided by the fracture porosity (i.e. the ratio of total flow area to fracture flow area). Overall, the SZ fracture velocities driven by repository heat are at least two orders of magnitude greater than those currently being attributed to the ambient system.

Thermally-driven buoyancy flow in the SZ is a result of changes in fluid volume, ΔV, which occur as the region below the repository is heated. Because ΔV increases with ΔT, the magnitude of buoyancy flow generally increases with ΔT. Although ΔV per unit volume of heated SZ is less for lower APD, the larger "footprint" associated with the low APD repository results in a larger overall region where this heat-driven change in volume takes place. Consequently, for a given amount of time-integrated heat, the cumulative effect of repository heating on driving convection cells in the SZ is similar over a wide range of APD. In general, the magnitude of repository-heat-driven buoyancy in the SZ is insensitive to the actual design of the repository and is primarily sensitive to the time-integrated heat (i.e. total mass of SNF emplaced in the repository). Consequently, the hydrothermal and potential geochemical consequences of heat in the SZ should not be considered a design issue, but rather the inherent response of the SZ to the emplacement of a given quantity of SNF.

Laboratory Experiments

Work continued on the measurement of electrical resistivity as a function of moisture content of Topopah Spring tuff samples from U3hg-1 and GU-3 hole at room temperature. The purpose of the measurement is to generate calibration curves of electrical resistivity of these samples with respect to moisture content so that laboratory and field determined resistivity can be interpreted in terms of degree of water saturation. A gold electrode was deposited on the flat surfaces of cylindrical disc samples. Two-electrode electrical resistance measurements were done on each one of the four samples with different thicknesses. Measurements have been made from dry to 100% pore volume saturation with water. The measurements in the drying phase will continue next month.

The investigation of the different imbibition rates of water into a rock sample when the sample is either in a vapor environment or in liquid water continued. To understand the mechanism of imbibition, capillary tubes of various inside diameters are put in a constant humidity chamber and are set at various levels of humidity. The imbibition rate of water into each capillary tubing will be determined.

Model Development & Documentation

J. Nitao is currently testing a prototype version of the NUFT code (Nonisothermal Unsaturated Flow and Transport) for nonisothermal radionuclide transport problems. NUFT, which can handle multi-phase heat flow and aqueous-phase multiple species transport, was primarily developed outside of YMP. J. Nitao sent a description of NUFT to J. Duguid, M&O/INTERA, so that it could be included in the M&O report "Review and Selection of Unsaturated Flow Models".

1.2.2.2.3 Mechanical Attributes of the Waste Package Environment

The Study Plan 8.3.4.2.4.3 will resolve part of one of the NRC's open SCP comments; the details were provided to the M&O.

1.2.2.2.4 Engineered Barrier System (EBS) Field Tests

The first draft of the Study Plan for the Engineered Barrier System Field Tests is in internal review.

W. Lin and J. Roberts visited R. Glass' laboratory at Sandia National Laboratories in Albuquerque, NM, on November 18. W. Lin gave a talk on laboratory investigation of fracture healing during that visit.

W. Lin attended the SOC meeting on November 10 and the Cost Reduction meeting on November 24, both in Las Vegas.

W. Lin, D. Wilder and J. Blink worked with the M&O and the Test Coordination Office to adapt the ESF heater tests to the ESF construction schedule. J. Blink assisted in the production of the ESF movie.

Large Block Test (LBT)

W. Clarke, D. Wilder, W. Lin, S. Blair, T. Buscheck, W. Glassley and J. Blink (LLNL), and L. Costin, J. Pott and C. Brechtel (SNL) visited NTS to inspect rock outcroppings for possible samples for the large block test. Contacts with Sandia National Laboratories and REECo have been made to evaluate various ways of obtaining blocks of Topopah Spring tuff from either Fran Ridge or Busted Butte. One facility has been identified that can finish the blocks according to LLNL's requirements for size and accuracy. Work has also started on designing the loading frame for the large block test.

An alternative to assembling the large block from 1 m^3 cubes is being considered. In this case, a 27 m^3 block would be carved into Fran Ridge and the loading frame would be constructed on site.

1.2.2.2.5 Characterization of the Effects of Man-Made Materials on Chemical & Mineralogical Changes in the Post-Emplacement Environment

Staff supplied a draft of a white paper entitled "Chemical and Mineralogical Concerns for the Use of Man-Made Materials in the Post-Emplacement

Environment" by A. Meike, R. Fish and D. Stahl (M&O). This paper discusses concerns for materials introduced into the ESF. It is now in internal review.

1.2.2.3 Waste Form and Materials Testing

1.2.2.3.1 Waste Form

R. Stout participated in the MRS meeting in Boston, MA on November 30-December 3.

R. Stout and J. Blink worked to resolve reviewer comments on the Preliminary Waste Form Characterization Report.

1.2.2.3.1.1 Waste Form Testing - Spent Fuel

Spent Fuel Dissolution

The five shorter duration uranium dissolution experiments begun last month at LLNL have been successfully completed. Their dissolution rates are being integrated with existing results. Those five cells are being rerun at the original room temperature conditions to check the reproducibility of the data.

The stainless steel system has demonstrated the ability to maintain the desired low dissolved oxygen concentration in the leaching solution. Additional systems are being designed and built to begin the low oxygen runs of the test matrix. They will be instrumented as necessary to monitor the dissolved oxygen level.

Multi-linear regression analysis was performed on PNL's spent fuel dissolution measurements. The results and additional variations on those fits are still being evaluated. They are also being compared with LLNL's UO_2 results.

A paper by W. Gray (PNL) entitled "Effects of Air Oxidation on the Dissolution Rate of LWR Spent Fuel" was approved by YMPO. This paper was presented at the MRS meeting in Boston, MA on November 30-December 4.

Spent Fuel Oxidation

Weight measurements taken from oxidation dry bath tests continued at PNL.

A paper by L. Thomas (PNL) entitled "Effects of Fission Products on Air-Oxidation of LWR Spent Fuel" was approved by YMPO. This paper was submitted to the Journal of Nuclear Materials.

Materials Characterization Center (MCC) Hot Cell Activities

The paper entitled "Methodology for Determining MCC Spent Fuel Acquisitions" by S. Marschman, R. Einziger (PNL) and R. Stout has been submitted for LLNL-YMP internal review.

1.2.2.3.1.2 Waste Form Testing - Glass

D-20-27 Unsaturated Testing of WVDP and DWPF Glass

The N2 tests (SRL actinide-doped glass) continue with no sampling period occurring this month. These tests have been in progress for 348 weeks. The N3 tests (ATM-10, a West Valley actinide-doped glass) continue and have been in progress for 266 weeks.

1.2.2.3.2 Metal Barriers

W. Clarke attended the American Society of Testing and Materials meeting in Miami, FL on November 16-18. Container materials researchers from the NRC and the international community presented their results. The DOE community had no presentation due to lack of funding in this area last year. On the positive side, ANL presented data from 19,000 hrs of accelerated testing in J-13 water of Inconel 825, stainless steel 304 and stainless steel 316; these tests began under LLNL-YMP sponsorship and have continued using ANL internal funds. During the test, which is equivalent to 300 to 1000 years of service environment exposure, no environmentally-assisted cracks formed in the specimens. Another 35 months of testing would extend the equivalent service life exposure to 10,000 years. LLNL-YMP will probably resume funding these experiments this year.

1.2.2.3.3 Other Materials

This WBS element has not been funded in FY93.

1.2.2.3.4 Integrated Testing

1.2.2.3.4.1 Integrated Radionuclide Release: Tests and Models

Determination of Elemental Profiles in Rocks, Minerals, and Glasses using the Ion Microscope

Planning continued for diffusion experiments using single crystals of clinoptilolite. Single crystals of clinoptilolite were saturated with Na, Ca, and K using 1 N salts. These samples will be used to test the experimental protocol.

Interactions of Actinide-bearing Solutions with Rock Core Samples

The saw-cut core to be used in the flow experiment was rehydrated using filtered deionized water. The surface of the saw-cut was cleansed of adhering particles using an ultrasonic probe. The core was assembled and jacketed in preparation for emplacement in the flow-through apparatus.

An isoparaffinic solvent (ISOPAR-H) is being tested as a potential fluid to apply confining pressure to the core. A sample of jacket material with epoxy sealer was immersed in the vent and heated at 150°C and 50 bar pressure to test compatibility of the materials under the maximum temperature expected in the flow-through apparatus.

1.2.2.3.4.2 Thermodynamic Data Determination

No significant activities.

1.2.2.3.5 Nonmetallic Barrier Concepts

This WBS element has not been funded in FY93.

1.2.2.4 Design, Fabrication, and Prototype Testing

1.2.2.4.3 Container/Waste Package Interface Analysis

This WBS element has not been funded in FY93.

1.2.3 SITE INVESTIGATIONS

1.2.3.1 Site Investigations Coordination and Planning

This WBS element has not been funded in FY93.

1.2.3.2 Geology

1.2.3.2.1.2.1 Natural Analogue of Hydrothermal Systems in Tuff

This WBS element has not been funded in FY93.

1.2.3.4 Geochemistry

1.2.3.4.2 Geochemical Modeling

The second geochemical code document entitled "EQ3NR, A Computer Program for Geochemical Aqueous Speciation-Solubility Calculations: Theoretical Manual, User's Guide and Related Documentation, Version 7" by T. Wolery was approved by YMPO and will be published in December. The third and fourth manuals of the set are awaiting approval at YMPO.

ISP-NF-08, "Individual Software Plan for EQ3/6 Version 8 and Subsequent Versions" was revised in response to review comments and approved. The Software Requirements Specification (SRS) and Software Design Documentation (SDD) for Version 8 were written and are being reviewed.

A few minor bugs in the Version 7.1 release were reported by users at ANL and the Center for Nuclear Waste Regulatory Analyses. These bugs are being analyzed.

1.2.3.10 Altered Zone Characterization

This WBS element has not been funded in FY93. Funding is expected after FY92 underrun funds are redistributed.

1.2.5 REGULATORY

1.2.5.1 Regulatory Coordination and Planning

This WBS element has not been funded in FY93.

1.2.5.2 Licensing

1.2.5.2.2 Site Characterization Program

W. Clarke, D. Wilder, T. Buscheck, W. Lin, W. Halsey and J. Blink participated in the NWTRB Structural Geology & Geoengineering Panel workshop on the ESF design and construction strategy in Las Vegas on November 4-5.

1.2.5.3 Technical Data Management

1.2.5.3.4 Geologic and Engineering Materials Bibliography of Chemical Species (GEMBOCHS)

The transfer of the GEMBOCHS database and software library from the local Sun 3/260 server (node s33 of the local Sun network) to a new, dedicated Sun SPARCstation2 (node s60) continued. Completion of this transfer will result in dramatically improved performance for each database and software module of the GEMBOCHS system. Several problems were encountered running the CNGBOCHS system on the s60. These centered on interfacing the package with an updated version of the electronic mail utility em. The problems were eventually resolved. EQPT was successfully ported to s60.

The detailed testing of program D0OUT (on node s33) using the recently restructured (August 1992) GEMBOCHS database was completed. This critical testing activity was carefully documented in the report entitled "Test Report for D0OUT-8612-SRC-V25, Rev. 0" by S. Lundeen.

D0OUT was used to generate a revised suite of thermodynamic datafiles (DATA0.[sup,nea,com,pit,hmw].R17) that supports the EQ3/6 geochemical software package (Version 7.1). These new datafiles were then piped through EQPT to generate the corresponding DATA1 suite, which was then transferred to the new dedicated directory for EQ3/6 DATA0 files, s60:/dberror/data0, where they can be accessed by local users of EQ3/6.

1.2.5.3.5 Technical Data Base Input

No significant activities.

1.2.5.4.2 Waste Package Performance Assessment

The manual entitled "PANDORA 1.1 User's Manual" by L. Lewis and C. Hardenbrook has completed internal technical review and has been returned to the author for comment resolution.

The paper by R. Bradford entitled "The Role of Multiple Barriers in Assuring Waste Package Reliability" began internal review.

1.2.9 PROJECT MANAGEMENT

1.2.9.1 Management and Coordination

1.2.9.1.2 Technical Project Office Management

J. Blink attended the Technical Advisory Group (TAG) meeting in Los Alamos, NM on November 17.

W. Halsey, R. Stout and D. Wolfe attended the Expert Judgment Panel meeting held in Albuquerque, NM on November 18-20.

W. Clarke and/or J. Blink represented LLNL at several meetings of the Infrastructure and Early Decision cost cutting groups.

J. Blink led a Boy Scout Atomic Energy Merit Badge session at the Yucca Mountain Information Office on November 7. Staff members from the M&O and SAIC assisted.

J. Blink (LLNL) and E. Harle (SAIC) made educational presentations to several 6th grade classes at K. Booker School in Las Vegas on November 3. Their hands-on energy lessons were attended by about 140 students. J. Blink also presented hands-on lessons on atoms and electricity to three 5th grade classes at R. Taylor School in Henderson. Finally, J. Blink and E. Harle presented hands-on energy lessons to four 9th grade classes at K. Guinn Jr. High School in Las Vegas on November 16.

J. Blink briefed the LLNL Educational Council on YMP Education Programs on November 6. A summary of his briefing was published in a local Livermore newspaper.

1.2.9.2 Project Control

1.2.9.2.2 Participant Project Control

The October FTE report was submitted to YMPO. The October actual schedule progress and costs to PACS reporting system was submitted via PACS workstation.

Changes were completed to the FY93 baseline as required by budget modifications. The baseline data are complete with the exception of FY92 carryover allocations.

The LLNL database has been uploaded to PACS via workstation. Several difficulties were encountered with the software, and after two executables were mailed to LLNL, the upload was finally successful. As carryover decisions are announced by YMPO, changes to workscope, cost plans and schedules will be made.

The cost plan was prepared for FY93 and cost data were entered for October. Planned vs. actual relationships are difficult for this period since several accounting adjustments are contaminating the "earned value" position of LLNL.

LLNL is in the process of revising its account structure to match and support the FY93 PACS database. This effort will be completed in December.

The property management inventory update continues. PRISM has several errors and several pieces of equipment are still without custodians or are not being used by NWF participants.

J. Podobnik attended the Project Control Steering committee meeting in San Diego, CA on November 9.

1.2.11 QUALITY ASSURANCE

1.2.11.1 Quality Assurance Coordination and Planning

A draft QA Program transition plan, required for implementation of the new QARD, was distributed internally to administrative and technical area leaders for their review and comments. The transition plan outlines changes required to simplify and streamline the LLNL-YMP QA Program in addition to meeting the QARD requirements.

D. Wolfe attended a meeting on the Implementation of the OCRWM QARD in Las Vegas on November 30.

1.2.11.2 Quality Assurance Program Development

A Change Notice was prepared for QP 2.8 to clarify requirements in response to YMP Surveillance SR-92-28 and CAR-YM-93-017.

1.2.11.3 Quality Assurance Verification

1.2.11.3.1 Quality Assurance Verification - Audits

CAR-LLNL-023 was completed, verified, and transmitted to YMPO.

1.2.11.3.2 Quality Assurance Verification - Surveillance

YMPO performed Surveillance SR-92-28 and issued CAR-YMP-93-017.

Surveillance S93-02 was performed on the Instrument Calibration Program.

Surveillance S93-01 was issued on the following activities:

1) G-20-2, "Determination of Elemental Profiles in Rocks, Minerals, and Glasses Using the Ion Microscope",
2) G-20-3, "Interaction of Actinide Bearing Solutions with Rock Core Samples",
3) G-20-5, "Interaction of Materials under Repository Conditions" and
4) G-20-6, "Source Term Model Development".

CAR-LLNL-026 was issued as a result of Surveillance S93-01.

1.2.11.4 Field Quality Assurance/Quality Control

This WBS element has not been funded in FY93.

1.2.11.5 Quality Assurance - Quality Engineering

Individual Software Plan ISP-NF-07, Rev. 1 "Initial Qualification of EQ3/6" was reviewed, completed, and distributed.

1.2.12 INFORMATION MANAGEMENT

1.2.12.2 Records Management

1.2.12.2.2 Local Records Center Operation (LRC)

Document Control issued six new revisions and two Change Notices under controlled distribution. Routine follow-up for receipt acknowledgments continues.

1.2.12.2.3 Participant Records Management

A total of 167 items were logged into the LLNL-YMP tracking system. This includes 38 records/records packages that were processed through to the CRF. Four action items were closed.

1.2.12.2.5 Document Control

LLNL received no funding under this WBS. Work performed to complete LLNL's obligation in this WBS is funded under WBS 1.2.12.2.2.

1.2.13 ENVIRONMENT, SAFETY AND HEALTH

1.2.13.1 Environment, Safety and Health Coordination and Planning

J. Blink wrote a memo to the Site Manager on November 24 suggesting the use of a logbook as a way to improve the efficiency and record keeping for project vehicles based at the FOC. This logbook would be maintained similarly to those used for aircraft and military vehicles.

J. Blink was appointed as the LLNL-YMP contact for RADCON and was also appointed to the ALARA Committee.

1.2.15 SUPPORT SERVICES

1.2.15.2 Administrative Support

Comments on the draft 7th Progress Report (PR) for work performed by LLNL during the reporting period of April 1-September 30, 1992 were sent to YMPO on November 23.

1.2.15.3 Yucca Mountain Site Characterization Project (YMP) Support for the Training Mission

A total of 22 different self-study assignments were issued and 59 people were trained to these assignments. Currently, there are 62 participants on the project who are to be trained and/or tracked.

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