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WBS: 1.2.9.1
QA: N/A

May 22, 1995

LA-EES-13-05-95-003

Mr. Wesley E. Barnes, Project Manager
Yucca Mountain Site Characterization Office
U. S. Department of Energy
P.O. Box 98608
Las Vegas, NV 89109-8608

Dear Mr. Barnes:

Los Alamos Monthly Highlights Report for April 1995: Highlights of Activity, Variance Analysis Report, and PACS Monthly Cost/FTE Report (SCPB: N/A)

Attached is the Los Alamos Monthly Highlights Report for April 1995, which includes the Highlights of the Monthly Activity Report. Variance Analysis Report, PACS Monthly Cost/FTE Report, and Milestone Status Report.

This report is an internal document describing our technical work; however, it has not received formal technical or policy review by Los Alamos or the YMP. Data presented in this document constitute predecisional information, should not be referenced, and are not intended for release from the U.S. Department of Energy as referenceable information.

The Variance Analysis Report identifies cost and/or schedule variances, analyzes those variances as to cause, and establishes any corrective action necessary.

The PACS Monthly Cost/FTE Report presents a monthly summary of Los Alamos' effort on the YMP. This report provides monthly totals of cost, labor person-hours, subcontractor person-hours, outstanding commitments, and accruals, all at the third level of the WBS. In addition, updated annual budget, approved funds, and annual cost values are provided.

If you have changes to our distribution list. please call Susan Klein at (505) 667-0916.

Sincerely,

Julie A. Canepa

JAC/SHK/cmv

Attachment: a/s

9512280257 - Part 2

Los Alamos Highlights for April 1995

WBS 1.2.1 Systems Engineering. David Bish, Schön Levy, and George Guthrie met with Steve Saterlie (TRW) to discuss mineralogy-petrology work in support of the thermal-loading decision process. They identified two areas for FY95 work: a calculation of water released from zeolitic tuffs under repository thermal loading and an assessment of existing mineralogy-petrology information pertinent to possible expansion areas surrounding the potential Yucca Mountain repository.

Schön Levy completed the first phase of an evaluation from the workshop on the decision process for characterization of the Calico Hills Geologic Unit, which was held at the end of March. Levy rated site characterization activities previously identified as potential tests for Calico Hills characterization, including the mineralogy-petrology activities, for strength of linkage to repository performance-failure modes. She identified moderate to significant linkages between the combined min-pet studies (including alteration history) and failure modes involving flow and transport through the following: fractures and faults, inadequate physical retardation, inadequate geochemical retardation, flow and transport through the matrix, lateral diversion above or within the CHn, adverse repository-induced thermal reactions, and adverse induced chemical reactions. The results were sent to Kurt Suchsland.

WBS 1.2.3.1.2/.3 Surface-Based Test Coordination. ***Staff Assistance.*** Staff assisted with the Discovery Days outreach program.

Staff coordinated with AMESH to satisfy land access and environmental compliance stipulations for the planned test pits north of Lathrop Wells.

Staff assisted Greg Valentine (10-14 April) in mapping maar volcanoes and quantifying xenoliths at the San Francisco Volcanic Field in northwestern Arizona.

On 23-24 April, staff excavated and back-filled trenches north of Lathrop Wells under the direction of Frank Perry, Les McFadden, and Steve Wells.

Staff attended the audit of Volcanism work (25-27 April) at the Los Alamos office in Las Vegas, NV.

Staff revised the stratigraphy of an orthophotographic map of Lathrop Wells and requested orthophotographic maps from EG&G.

Staff completed documentation of a map on Split Wash vegetation assemblages and instrument locations, and submitted this documentation to Daniel Cooper.

Staff obtained information on pumping water out of boreholes and wells for Charles Cotter, who is setting up colloid testing activities.

Staff attended surface-based planning meetings.

WBS 1.2.3.2.1.1.1 Transport Pathways. Staff photographed, subsampled, and prepared fracture samples from transmissive intervals of the saturated zone in USW G-4 and UE-25B#1H for sorption and fracture-flow experiments. These samples include *liesegang*-banded fracture walls from the transmissive zones in UE-25B#1H. Such fractures, with clear evidence of flow and water-rock interaction, are significant in (1) defining the geochemistry of saturated-zone, water-rock interaction and the extent of chemical-exchange penetration into the rock matrix, and (2) providing materials for combined fracture-flow radionuclide exchange experiments and microautoradiography to determine the phase dependence of such exchange.

Fine materials, washed from the ends of sample UE-25 UZ-16 1362.3-1362.7 during flow experiments at CST division, were examined by X-ray diffraction. These studies show that the very small amount of fines washed out represent a close approximation of the bulk sample, which is zeolitic, and do not represent preferential loss of any mineral components.

Staff examined thin sections of samples used in microautoradiography experiments by SEM. Backscattered electron images and energy-dispersive mapping can be used to shed light on the relations between the abundant zeolites and minor clays in zeolitic tuffs. These relationships are important because microautoradiography shows that Pu sorption is associated with the minor clay occurrences, rather than with the abundant zeolites. The clays are often concentrated in the most porous of the altered pumices of the Calico Hills Formation, a factor that may be important in evaluating waste retardation in the porous rock matrices of poorly fractured, zeolitized horizons. However, the clays also typically occur as replacements of the bodies of altered glass shards that are in turn "armored" by euhedral clinoptilolites, a factor that may limit access of solutions to clays. Staff made additional surveys of samples from the zeolitized Prow Pass Tuff and from the vitric nonwelded Calico Hills Formation; the vitric Calico Hills Formation differs because much of its clay content is dispersed as septae in pore spaces. Preliminary surveys were completed to determine the potential for measuring radionuclide concentrations in microautoradiographs by X-ray mapping of the Ag abundances in overlying emulsion. Initial results were promising.

George Guthrie, Robert Raymond, and Steve Chipera prepared a poster presentation for the High-Level Radioactive Waste Conference held 30 April - 5 May. They presented data on the mineral contents of dusts deposited in the vicinity of drill hole USW SD-9, in comparison with dusts deposited in the greater Yucca Mountain region. In addition, David Bish, Steve Chipera, and Barbara Carlos completed preparation of an oral presentation for the International Conference on High-Level Radioactive Waste. This presentation will provide information on the distribution of zeolites and calcite fracture fillings in core from Drill Hole Wash.

Staff analyzed six samples from the potential erionite-bearing horizon in drill core USW SD-7 (four bulk rock and two fracture-coating samples). They found no erionite in the samples analyzed and believe that no significant quantities of erionite exist in this drill core.

Staff attended YMP GET and blood-borne pathogen training this month. In addition, they attended briefings on the new YMP system for tracking data and associated procedures.

WBS 1.2.3.2.1.1.2 Alteration History. An internal quality-assurance audit focusing on one recent alteration-history, technical-information product was conducted during the first week of April. Staff also attended GET and blood-borne pathogen training.

Giday WoldeGabriel and Schön Levy prepared an abstract about ion exchange and dehydration effects on potassium and argon contents of clinoptilolite for presentation at the Scientific Basis for Nuclear Waste Management XIX symposium in November. The paper will summarize (1) results of potassium-argon geochronology studies of clinoptilolite, and (2) experimental studies of potassium exchange and argon diffusion under saturated and unsaturated conditions as indicators of processes that may have reset the potassium-argon systematics of clinoptilolite in the unsaturated zone. The timing of zeolitization at Yucca Mountain is an issue that relates to paleohydrology, zeolite stability, and unsaturated-zone geochemical processes.

WoldeGabriel also began cleaning and pulverizing a zeolite-rich altered tuff from the Jurassic Morrison Formation, west of San Ysidro, New Mexico, for clinoptilolite separation. Size fractions were separated by sedimentation in deionized water and will be analyzed for purity by XRD. The bulk sample contains quartz and trace amounts of calcite and smectite, in addition to clinoptilolite. Depending on their purity, the various size fractions will be used in the argon diffusion experiments. The Morrison clinoptilolite was chosen in preference to Yucca Mountain zeolites because it is older and contains more radiogenic argon, thus increasing the reliability of any detected changes in argon isotopic composition resulting from the diffusion experiments.

Schön Levy completed the first phase of an evaluation from the workshop on the decision process for characterization of the Calico Hills Geologic Unit, which was held at the end of March. Levy rated site characterization activities previously identified as potential tests for Calico Hills characterization, including the mineralogy-petrology activities, for strength of linkage to repository performance-failure modes. She identified moderate to significant linkages between the combined min-pet studies (including alteration history) and failure modes involving flow and transport through the following: fractures and faults, inadequate physical retardation, inadequate geochemical retardation, flow and transport through the matrix, lateral diversion above or within the CHn, adverse repository-induced thermal reactions, and adverse induced chemical reactions. The results were sent to Kurt Suchsland.

William Carey and Steve Chipera finished construction of an automated humidity-control unit for the X-ray diffraction equipment and have been working out problems in the system. They have now begun to collect XRD data at controlled humidities on a Na-exchanged sample of smectite from Cheto, Arizona.

Schön Levy began a scanning-electron microscopic (SEM) study of secondary silica and other secondary minerals from breccia zones in the Tiva Canyon tuff within the ESF north-ramp starter tunnel and the ramp proper. There is a surprising variety of texture and mineralogy in the breccia cements and deposits beyond the common botryoidal opal and drusy quartz in fractured Tiva Canyon tuff. A number of deposits exhibit a generally similar

succession of layers outward from the rock surfaces. The innermost layers are highly porous and contain variable amounts of opaline silica, probable zeolites, potassium feldspar, and a crystalline silica phase. The crystalline phases appear to have formed at the expense of the opal, which shows signs of dissolution. The outer layers consist of botryoidal silica ñ, probably opal-CT, and chalcedony ñ and drusy quartz. Recrystallization of the porous layers occurred after deposition of overlying silica, and some of the dissolved opal may have been redeposited in the outer layers. Characterization of these deposits is intended to support stable isotope studies of secondary silica within the climate program, provide natural analog information pertinent to possible alteration surrounding a waste repository, and continue our assessment of evidence relevant to Quaternary geochemical processes.

Staff was waiting for the first samples from hydrothermal runs at relatively low water-rock ratios (3:1) from LLNL. The samples will be characterized by X-ray diffraction. Studies of alteration in drill core and ESF north-ramp samples are ongoing. Material from the ESF samples studied by SEM will be separated for XRD identification. Purification and characterization of zeolite fractions for argon diffusion studies will continue, as will the collection of structural data for hydrous minerals at controlled humidity.

WBS 1.2.3.2.1.2.2 Kinetics and Thermodynamics of Mineral Evolution at Yucca Mountain. ***Clinoptilolite Rates.*** Penn State YMP researchers started a clinoptilolite flow-through experiment at 125°C. Initially, the input solution is set just below saturation with respect to Na-clinoptilolite, as determined from the solubility experiments; thus, the rates of dissolution are expected to be slow. Later, input solutions will be backed off successively from equilibrium so that progressively more undersaturated conditions will be monitored with expected faster rates of dissolution. It is likely that this initial experiment will provide guidance for designing future experiments.

The seven flow-through experiments started last month with clinoptilolite are still running at Yale. These experiments are being carried out to examine ranges of Si and Al concentration that were not covered in previous experiments. In particular, YMP researchers were concerned about the apparent secondary precipitation in clinoptilolite experiments with elevated Si concentrations, based on the low Al output, such as CPD80-16 reported two months ago. Several of the current experiments also have anomalously low Al concentrations in the output solutions compared with values predicted by the output Si concentrations (assuming the Al/Si stoichiometry of the clinoptilolite). In addition, analysis of the input solutions for two of the experiments also indicates Al concentrations significantly lower than expected, even for cases that are undersaturated with respect to secondary phases. Therefore, YMP researchers are testing for possible problems in the catechol violet analytical method for Al. It might be necessary to use a different method for Al analysis for experiments closer to equilibrium.

K-Clinoptilolite Solubility. Penn State researchers completed K-saturation of the Castle Creek clinoptilolite and a clinoptilolite from Mud Hill, CA, using 3M KCl at 120° C. They are in the process of measuring bulk chemical compositions of both of these exchanged clinoptilolites. Solubility experiments (at 90°, 125°, 175°, 200°, 225°, 265° C, i.e., at the same T's as used with Na-clinoptilolite) are beginning on the Castle Creek clinoptilolite.

Analcime Solubility. The batch solubility experiments are still running at Yale. Four new batch experiments were started for solubility measurements of analcime. One 80°-C batch experiment is using an aliquot from the Mont St. Hilaire analcime prepared and used by Penn State and will serve as a comparison with the Penn State solubility measurements. Batch experiments at 25°, 50°, and 80°C were started with the sedimentary analcime supplied by Los Alamos. These experiments will provide a comparison with the experiments on the hydrothermal Mont St. Hilaire analcime and will allow an assessment of the effects of non-stoichiometry in sedimentary analcimes.

Conceptual Model of Mineral Evolution. Work continued on modeling the clinoptilolite to analcime transition by conducting equilibrium stability calculations using estimated thermodynamic data for the zeolite phases. Also, to constrain water chemistry used in the thermodynamic modeling, experimental results from LLNL were examined to determine variation in water composition at elevated temperatures that would be encountered due to emplacement of a potential repository. LLNL researchers over the past years have heated devitrified and vitric Topopah Spring Tuff samples in J-13 water and monitored the water chemistry.

The equilibrium stability calculations confirm what has been previously proposed by other researchers, namely, that silica and sodium activities are major controllers of the reaction. The calculations also show that in environments such as Yucca Mountain, silica activity will be more significant in controlling the reaction than Na concentration, whereas the reverse is true in alkaline-saline lake environments. Preliminary modeling using observed chemical compositions for Yucca Mountain clinoptilolites and analcimes at 100°C and at observed and projected Yucca Mountain water compositions, shows that all clinoptilolites are stable if silica saturation is kept in equilibrium with cristobalite. If silica saturation, however, is reduced to be in equilibrium with quartz, some of the clinoptilolites included in the calculations would transform to analcime.

WBS 1.2.3.2.5 Volcanism. Staff led two field trips to the Lathrop Wells volcanic center. The first expanded information about the Los Alamos volcanism program for an external review panel. This panel had previously submitted a written report to the Center for Nuclear Waste Regulatory Analyses (CNWRA) that was critical of Los Alamos work conducted at Lathrop Wells. As a result of the field trip, committee members gained a much more complete scope and purpose of the Los Alamos volcanism program. However, they still disagreed with alternative interpretations of multiple, time-separate volcanic events at the center. The purpose of the second field trip was to provide information to the Geomatrix-directed Expert Judgment Panel on Volcanism.

Structural Controls of Basaltic Volcanism. The scope of work structural-controls studies with Golder Associates was completed and submitted to the M&0 for contract processing.

Eruptive Effects. Staff spent one week in the San Francisco Volcanic Field (Arizona) carrying out studies of xenolith abundances and depth of origin. Two volcanic centers were studied. The first of these is Dry Lake, which consists of a cluster of scoria cones with lava flows, formed by effusive and Strombolian eruptions. The cluster was disrupted by collapse of a

maar crater during a hydrovolcanic phase at the end of the eruptive sequence. Xenolith abundances were measured in scoria deposits in the field, and all eruptive units were sampled for component analysis in the laboratory. The second volcanic center studied is Rattlesnake Crater, which is a maar volcano on the southeastern margin of the volcanic field. Exposed deposits of at this center consist entirely of extra crater ejecta, mainly deposited from pyroclastic surges. Xenolith abundances were measured in the field and will also be studied in the laboratory. Future work at this volcanic field will focus on scoria cones that are actively being quarried near the town of Flagstaff.

Subsurface Effects. Staff completed milestone 4024, "Spatial scales of effects on the potential Yucca Mountain repository due to convective air flow induced by igneous intrusions." This report describes modeling studies aimed at determining the maximum spatial scale of effects of an intrusion of typical volume and magmatic composition for the Yucca Mountain region. This information will be used for probability calculations that take into account how far from the repository an intrusion must be to have negligible effects. Based on the modeling presented in this activity, this distance is roughly 2.5 km. While there are geometric and hydrologic complexities that still need to be incorporated into these calculations, staff anticipates this result will be useful for ongoing probability calculations. Staff is incorporating the aforementioned complexities in the next phase of modeling studies. A paper describing some of the more generic aspects of this work was also being prepared for submission to the *International Journal of Heat and Mass Transfer.*

Staff spent three days at the Paiute Ridge intrusive complex, NTS, carrying out detailed sampling of tuff wall rocks around basalt intrusions and detailed mapping of alteration patterns, intrusion geometries, and structures. A map is currently being prepared to illustrate these features. It will be used to estimate effects of intrusions on a potential repository. Samples are being processed for chemical and mineralogical analysis.

Magma System Dynamics. Staff continued literature review of melting and magma migration processes in the mantle, and the effects of mantle compositional heterogeneities on magma evolution.

Geochemistry Studies. Univariate and multivariate statistical analyses of the major- and trace-element geochemical data for the Lathrop Wells center were initiated during the month. The initial activities concerned assessing data distributions, which affect the applicability and interpretation of multivariate statistical analysis, for departure from normality. Work to date shows that geochemical data for chronostratigraphic unit IV are recognized consistently as outliers on probability and quantile distribution plots, and cause non-normal data distributions.

Th/La versus Mg number systematics were explored for samples from Lathrop Wells and Little Black Peak. Models for fractional crystallization and assimilation/fractional crystallization were compared with the Th/La-Mg number data.

Evolution of Basaltic Volcanic Fields. Ten analyses of Sr, Nd, and Pb isotopes were completed for samples from Red Cone, Thirsty Mesa, Little Cones, and Lathrop Wells.

Field Studies. Two days of trench studies were completed north of the Lathrop Wells scoria cone to explore the relationship of scoria fall deposits from Lathrop Wells with Quaternary alluvial fan stratigraphy.

A conceptualized cross-section of the Lathrop Wells volcanic center was completed as part of preparations for the field trips. Minor editing of the Lathrop Wells geologic map was completed and transferred to the orthophotographic base map.

WBS 1.2.3.2.6.1.4. Paleoenvironmental History of Yucca Mountain. ***Independent Dating.*** Staff continued sampling for cosmogenic dating of Quaternary landforms at Yucca Mountain (23 April- 5 May). (The necessary field studies and sample collection were 75 percent complete.) All boulder deposits and Red and Black Cones were initially sampled, and samples were collected from all four boulder deposits (two basalt and two tuff). Sampling for the refinement of the rock-varnish calibration curve was then half completed. Staff also collected samples to determine the bedrock erosion rates on Yucca Mountain.

Chemical preparation of samples continued, and the data on the Ghost Dance-fault sampling sites have been reviewed to obtain better geometry and shielding information. This new information should allow for a better correction of values for these effects and produce better age estimates. Thus, appropriate geomorphic surfaces have been sampled to address most of the dating questions necessary for this year. Field information continues to determine how best to date these tuffs and basalts cosmogenically. Researchers at the University of Pennsylvania are performing accelerator analyses of beryllium in YMP rock samples.

WBS 1.2.3.3.1.2.2. Water Movement Test. Preliminary results were obtained for chlorine-36 analyses of 21 Yucca Mountain samples plus associated blanks and a standard. Nine UZ-16 samples were taken from the Prow Pass unit, depths ranging from 1486 to 1623 ft, and had ratios of chlorine-36 to total chlorine ranging from 20 percent to 70 percent of the modern meteoric signal. Three UZ-14 samples were from the Paintbrush nonwelded unit, depths of 275 to 290 ft, and had ratios of 22 percent and 98 percent of the modern signal. Staff did not see any unambiguous evidence for bomb-pulse chlorine-36 in any of these samples, although such a signal may have been diluted by release of chloride from the rock during sample collection or processing. Chlorine-36 results for nine surface soil samples forming a transect across middle WT-2 Wash, in the vicinity of N53, N54 and N55, ranged from present-day meteoric background to nearly five times background, as expected, reflecting the lingering presence of global fallout of chlorine-36. However, the highest ratio in these samples was still one order of magnitude less than the peaks measured in samples from the Paintbrush nonwelded unit in N55.

Staff compared chlorine-36 results obtained by two different preparation techniques for two pairs of rock samples. The standard technique, batch extraction, by which the sample is leached in a single pass, is inefficient when the sample size consists of several kilograms of material because it results in a large volume of dilute leachate from which it is time-consuming to extract the chloride for isotopic analysis. A more efficient technique, which was tested last month, is to contact the leachate with several smaller batches of the sample, in

sequence, thereby increasing the chloride concentration in the leachate with each step, and making it much easier to extract the chloride from the final solution. Chlorine-36 results received this month indicated that the same analytical result was obtained with both techniques.

Staff continued to develop a step-leaching procedure for determining the chloride-to-bromide (Cl/Br) ratio of Yucca Mountain tuffs. This value must be known to correct chlorine-36 based ground-water travel times for any dilution by chloride released from the rock during sample collection or processing. Without such correction, calculated travel times will be older than the true value. The procedure involves repeated grinding and leaching of the rock sample, thereby decreasing the meteoric component and increasing the rock component of Cl and Br (presumably released from fluid inclusions) with each step. As expected, the Cl/Br ratio in the leachate tends to a constant value with the last couple steps, which represents the intrinsic ratio for the rock. Results of experiments indicate that the Cl/Br ratio of 500 measured for halides in a Topopah Spring tuff sample from UZ-16, 1110 ft depth, is considerably higher than that for meteoric halides (about 50 to 200), as expected, and is necessary for this travel-time correction method to work. Based on this approach, staff were drafting a detailed technical procedure to characterize the variability of the rock Cl/Br ratio throughout the units comprising Yucca Mountain.

To address the question of the Cl/Br ratio for the meteoric component, staff collected additional rain-water samples from rain gauges at Yucca Mountain, bringing the total inventory of such samples up to 114. About half of these have been analyzed thus far for Cl/Br. Chloride concentrations range from 0.2 to 3 mg/L, averaging 0.5 mg/L, or about 0.5-5 percent of the Cl concentrations typically measured in Yucca Mountain pore waters extracted from drill core. Cl/Br ratios ranged from 20 to 164, averaging 65. These results have not yet been thoroughly reviewed for accuracy.

Five rock samples forming a transect of the Bow Ridge Fault in the ESF were analyzed for Cl/Br prior to being processed for chlorine-36 analysis. However, the low ratios indicated that three of these had probably been contaminated with water used to spray the ESF walls prior to mapping. Staff contacted the U.S. Bureau of Reclamation staff responsible for sample collection in the ESF to discuss the results and to request that the transect be resampled; a sample of the spray water was also collected.

Five spring and 13 perched water samples were provided by the USGS for chlorine-36 and Cl/Br analysis. The perched water was collected from SD-7 and ONC-1. Eight pore-water samples extracted from UZ-14, UZ-16, NRG-6 and NRG-7/7A core were received from the USGS for Cl/Br analysis. The Cl/Br ratios of the pore waters will be compared against those obtained by leaching the corresponding cuttings (used for the chlorine-36 analysis) to assess the extent of chlorine-36 dilution by Cl released from the cuttings.

Staff continued work on reconstructing the monthly tritium-input function for Yucca Mountain from the 1950s to the present time, based on the assumption that it would have been similar to that measured at Albuquerque, NM. Local tritium data are being sought to test this assumption. Peak signals of 3000 to 4000 tritium units (TU) occurred at Albuquerque in

March-June of 1963 and 1964; these would have decayed to 500 to 640 TU at the present day. The USGS will combine the reconstructed tritium data with monthly precipitation and evapotranspiration data for Yucca Mountain to estimate the concentration of tritium infiltrating into the subsurface over that time period, which in turn will provide an input function for the Project's site-scale hydrologic and solute transport models. Analogous input functions for carbon-14 and chlorine-36 are also being prepared.

Staff completed and issued a new technical procedure for measuring conductivity in soil extracts.

WBS 1.2.3.3.1.2.5. Diffusion Tests in the ESF. Staff completed revising the study plan titled, "Diffusion Tests in the ESF." This revision constitutes completion of milestone 4090. The study plan was being reviewed by the TPO.

WBS 1.2.3.3.1.3.1. Reactive Tracer Testing. ***Lithium Bromide Column Experiments.*** Analyses of lithium and bromide samples from these experiments was completed. These column experiments were intended to investigate the effects of kinetics and nonlinear sorption on the transport behavior of Li. The tests were conducted by stepping the concentration of LiBr in the column inlet solutions to a specific level, allowing the effluent concentrations to reach that level, and then flushing the columns with J-13 water until LiBr was essentially completely eluted out of the columns. Preliminary results indicated that the assumption of linear, equilibrium sorption of Li appears to be valid as lithium is loaded onto the column packing material (crushed Bullfrog tuff), but the desorption of lithium does not follow linear, reversible, equilibrium isotherm behavior. Under completely linear, reversible, equilibrium conditions, one would expect the adsorption and desorption portions of the lithium breakthrough curves to be essentially mirror images of each other. However, while the adsorption portion of the curves show a typical delay in lithium response relative to bromide, it appears that the lithium initially elutes from the columns at the same time as bromide (indicating slower desorption than adsorption), and the lithium concentration then levels off and lithium continues to elute from the columns long after the bromide concentrations have dropped to background levels. Staff are analyzing these results to ascertain whether the observed behavior can be best explained by a nonlinear or hysteretic adsorption isotherm, by kinetics, or by mass transport (or possibly a combination of these). The results of the analyses could have an important impact on both the pre-test predictions of LiBr transport in the C-wells field-scale experiments and on the interpretation of the field experiments.

Preparation for Field Testing. Sufficient quantities of fluorescent polystyrene microspheres and LiBr were procured for field-tracer testing activities at the C-wells. Tracer tests are scheduled to commence in FY 1995 (by July or August) according to most recent schedule information. In addition to the C-wells tracer tests, staff are planning to participate in a smaller-scale field tracer test at the Raymond Quarry site, CA, in May as part of the International Program cooperative effort with LBL, the USGS, and the AECL (Atomic Energy of Canada, Ltd).

Pretest Predictions of Solute Transport. Progress is continuing on activities reported in the March 1995 monthly report. This effort will culminate in a milestone report (milestone 4077) scheduled for completion at the end of FY95.

Laboratory Experiments to Support Model Development/Validation. Laboratory experiments were being planned for the summer of 1995 to investigate the effects of matrix diffusion on the transport behavior of both nonsorbing solutes and polystyrene microspheres. The objective of these tests is to validate and further develop, if necessary, existing models of solute transport through systems in which solutes advect with fluid flow in high-conductivity channels (e.g., fractures) but also diffuse into stagnant regions in the pores of the system matrix (e.g., fracture walls). The experiments will be similar to the LiBr column experiments mentioned above except that they will be conducted in "columns" made from actual tuff cores so that the column "walls" are porous. The packing material in the columns will be nonporous glass beads. The experiments will complement the ones conducted last year in natural fractures, but they will have a better defined geometry/flow field and a wider range of wall porosities than the fractures. Yucca Mountain cores have been obtained (via formal transfer in accordance with YAP-SII.1Q) from Barbara Carlos and Schön Levy at Los Alamos. The cores were not taken from the C-wells, but they will offer a wider range in porosities than could be obtained from C-wells core. In addition to the core "columns," a glass column of the same dimensions as the core columns will be used in the experiments. The glass column will allow a comparison of solute and colloid transport behavior with matrix diffusion to that without matrix diffusion, as the glass walls will have zero porosity. Because this activity will be partially funded by the International Program's budget and will not involve materials that are directly relevant to the C-wells, a decision has not yet been made as to whether the effort will be conducted as a quality-affecting or scoping/prototyping activity. However, the information obtained from this study could be valuable in the prediction of tracer and radionuclide movement through saturated fractures over large scales at Yucca Mountain, and it could potentially help in interpreting the C-wells conservative and reactive tracer tests.

WBS 1.2.3.4.1.1. Ground-Water Chemistry Model. Staff initiated water-rock interaction experiments. Initial experiments involved J-13 water and samples of each of the three major types of tuff (i.e., devitrified, vitric, and zeolitic). These prototype experiments will be used to establish the experimental and analytical protocols. Because the J-13 aquifer is in devitrified Topopah Springs tuff, we do not expect to find much change in water chemistry in the devitrified tuff experiment over the duration of the experiment. For the vitric and zeolitic tuffs, measurable water chemistry changes are expected.

The data on the chemistry of unsaturated-zone waters recovered from UZ-14 and UZ-16 cores received from the USGS last month have undergone preliminary evaluation. It is clear from these data that substantial variations exist in unsaturated-zone water chemistry. It is the purpose of this task to develop an understanding of the causes of these variations.

WBS 1.2.3.4.1.2.2. Biological Sorption and Transport. Larry Hersman presented an invited paper at the ACS meetings in Anaheim, CA, 2-6 April titled, "Iron Acquisition from Hematite by an Aerobic Pseudomonas sp." The following week Hersman attended an LLNL-sponsored workshop in Lafayette, CA, on the potential for microbial influences corrosion (MIC) of the

primary containment. The main focus of this workshop was to determine if MIC poses a significant challenge to the integrity of the primary containers; the general consensus of the meeting was that MIC could be a problem.

Staff continued the iron-transport column studies. Both chelated and unchelated iron have been passed through crushed-tuff columns. There was a significant difference between the two transport rates with the chelated species having the faster transport rate. This experiment was being repeated.

WBS 1.2.3.4.1.3 Speciation/Solubility. ***Speciation Studies of Dilute Actinide Solutions.*** The upgrade to the PAS laser system continued. The laser used for this activity was in California for retrofits. In the meantime, staff prepared and shipped samples of Pu(V) and Pu(VI) carbonato complexes for EXAFS experiments to be performed at the X-ray beam line at Stanford (SLAC) in May. These experiments will determine the structure of both solid and solution species, and are aimed at generating a structure/reactivity model for use in evaluating the database used for the Yucca Mountain Project. Structure/reactivity models are basic tools in inorganic chemistry used to rationalize trends in bonding strengths and complex formation among related species (e.g., U, Np, Pu, and Am in similar oxidation states), and because solubility is determined by complex formation, ultimately to be able to scientifically determine an expected solubility distribution through the development of reasonable thermodynamic constant tables.

The computer-modeling studies focused on evaluating the database by modeling the solubility of Np(V) in J-13 by comparing the results from the standard EQ3/6 database to the equilibrium values reported in milestone 3413, and comparing all of this to published bulk solubility results. Evaluation of distribution of aqueous species with respect to redox state and controls on mineral saturation state continued. Staff proceeded with evaluating Np data in the standard EQ3/6 v7.2a-PC release package, which includes data sets with R22a versions. Staff also included in that evaluation an alternate composite data set (R1b), which incorporates aqueous dissociation constants for Np, Pu, and Am complexes, supplied by LLNL. The added Np data in the alternate database is strongly correlated with U data. Staff confirmed that these data result in calculated solution speciation that is not consistent with previous interpretations of solubility and speciation laboratory experiments; however, mineral solubility results are virtually identical. The primary difference is under neutral to acid conditions in which NpO_2+ is replaced by $Np(OH)_4$, involving a shift in redox state.

Solubility Studies. The actinide solubility studies (Pu and Np) have been started at Los Alamos. In contrast to previous bulk solubility experiments, the pH will not be manipulated through addition of HCl or NaOH during these experiments, thereby maintaining low ionic strength waters of the natural J-13 and UE-25 systems. The pH will be set at the beginning of the experiment and simply monitored throughout the experiment. The lack of additional Na is especially important for the neptunium solubility study, as the sodium-containing "double salt" $NaNpO_2CO_3$ precipitation product has been reported. In the meantime, Dave Hobart from LBL has submitted the following report regarding the selenium studies:

Scoping experiments are continuing on fission product selenium solubility and speciation studies. Previously, the YMP SOLWOG preparation of a "Radionuclide-Ligand Priority Matrix" for Yucca Mountain pointed out that some of the radionuclides are really radio ligands and could complex other radio cations (e.g., actinides). Thus, we can envision synergism whereby a radioactive actinide is complexed by a radioactive fission product (e.g., selenium) and may become more or less mobile in the ground-water environment. Recent laboratory experiments have provided some interesting results:

(1) Dissolution of solid sodium selenate decahydrate ($Na_2SeO_4 \cdot 10H_2O$) in our laboratory in synthetic J-13 well water (minus the magnesium and calcium cation components) yields solutions that are greater than 2.5 Moles per/L at room temperature and pH 6.5. This is essentially a high ionic-strength selenate brine. As discussed at the SOLWOG meeting, it was suggested that perhaps the solubility-limiting-solid might be calcium or magnesium selenate. We have experimentally determined that unlike its lighter relative, sulfate, the solubility of Ca selenate is greater than 1 M at room temperature. The SOLWOG group determined that scoping experiments were in order to investigate the interaction of selenate ions with actinides. These experiments are in progress. The isotopes used were stable Se, U-238, Np-237, Pu-239, and Am-243.

(2) To study plutonium(IV) selenate complexation, an aliquot of Pu(IV) was added to a stock solution that was 1 M in selenate ion at pH 6.5. UV-VIS-NIR spectra were recorded and compared to those in noncomplexing perchloric acid medium. Rather dramatic shifts in the main absorption bands and changes in their shapes indicate significant complexation by selenate ions. Indeed, the fact that Pu(IV) is not forming colloid at pH 2.5 is evidence for stabilization of Pu(IV) as the selanate complex.

(3) Neptunium(V) was also investigated. No dramatic change in the spectrum was observed and it is initially suspected that selanate does not complex Np(V) or other actinide(V) ions.

(4) Americium stock solutions are being prepared, but the spectra are not yet available for inclusion in this monthly report. Plutonium, in the Pu(III) state, experiments are in progress.

(5) Although natural thorium and uranium minerals and compounds containing stoichiometric amounts of selenium are known, this is the first report of the preparation of a transuranium element selenate complex.

Meetings. David Hobart, David Clark, Clarence Duffy, and Drew Tait participated in the SOLWOG meeting in Las Vegas, NV. Of particular note, David Clark presented an overview of an NEA-type analysis of Np(V)-carbonate complexation reactions, including SIT treatment to obtain the thermodynamic (i.e., "zero ionic strength") equilibrium constants. SOLWOG will be required to perform such work with Np and Pu so the project is sure of a consistent and reasonable database for solubility calculations.

David Clark and Phil Palmer represented the YMP Solubility Group at the National Meeting of the American Chemical Society in Anaheim, CA. Three talks were presented:

"Spectroscopic and Structural Studies of Environmentally Relevant Neptunium(V) and Plutonium(V) Complexes;" D.L. Clark, S.D. Conradson, N. Hess, M.P. Neu, P.D. Palmer, C.D. Tait, 209th ACS National Meeting, Nucl. Chem. & Tech. Div., Anaheim, CA, April 2-7, 1995.

"Spectroscopic and Structural Studies of Environmentally Relevant Neptunyl Carbonate Complexes;" P.D. Palmer, D.L. Clark, M.P. Neu, C.D. Tait, S.A. Ekberg, T.W. Newton, 209th ACS National Meeting, Div. of Chem. Techn., Anaheim, CA, April 2-7, 1995.

"Carbonate and Hydrolysis Complexation Studies of Actinyl Ions: Toward Understanding the Environmental Behavior of U, Np, and Pu;" D.L. Clark, S.A. Ekberg, M.P. Neu, P.D. Palmer, and C.D. Tait, 209th ACS National Meeting, Div. of Geochem., Anaheim, CA, April 2-7, 1995.

WBS 1.2.3.4.1.5.1, 1.2.1 Retardation Sensitivity Analysis and Performance Assessment. ***Fracture Flow Modeling***: The solute transport capability for the dual permeability option in FEHM has been restored. The code yields acceptable results for one-dimensional problems for cases ranging from complete fracture flow and transport with no diffusion to complete diffusion into the pore space of the matrix. After performing a few additional checks against known solutions, we will check this revised code into the controlled version of FEHM.

Modeling of Np Laboratory Experiments. Staff began modeling the Np rock-beaker diffusion tests in the Yucca Mountain tuffs. It was determined that for some of the experiments, the sampling procedure resulted in a significant drop in the fluid level in the beaker over time, and that this, in turn, must be accounted for when simulating the experiments to obtain diffusion coefficients. A special subroutine to handle a dropping fluid level was placed into a version of FEHM to carry out this modeling. Diffusion coefficient values were then obtained for several Calico Hills tuffs. Diffusion coefficients for tritiated water were fairly consistent from run to run, with values of about 4 to 6×10^{-10} m^2/s. Values for Np diffusion in tuffs on which there is little or no sorption yield values up to an order of magnitude lower than this. The difference is probably due to size exclusion. However, sorption is also a key factor in measuring the uptake of Np into the rock matrix. One experiment on a zeolitized tuff has been analyzed. A good fit was obtained to the data if the diffusion coefficient measured for a devitrifed (non- sorbing) tuff is coupled to sorption. A Kd value of 3 ML/g was required to fit the data. This value is entirely consistent with the sorption coefficient values measured in batch and column sorption lab tests. Thus we have a consistent picture of the phenomena governing the behavior of Np diffusion experiments for both sorbing and nonsorbing tuff samples.

Work has begun to simulate the behavior of solid-rock column sorption experiments with Np. These tests are designed to verify that carrying out the transport tests on crushed rock has little or no impact on the results. So far, only the tritiated water data have been modeled. Due to the lower aspect ratio that was needed to move fluid through the column at reasonable

pressures, there is considerably more dispersion in the breakthrough curves. The values of the dispersion coefficient are still in a reason- able range where the one-dimensional axial dispersion model can be used reliably.

Code Development/Optimization. The dispersion model in the solute transport module of FEHM has been upgraded to improve performance for unstructured grids. The dispersion coefficient, which contains a dispersivity times velocity term, is now formulated using the internode mass-flux values, rather than resolving a velocity vector at each node. This change corrects problems near material interfaces and boundaries, where the computation of flow velocity is most difficult. Using the internode mass fluxes, we now compute dispersion coefficients that are entirely consistent with the fluid-flow portion of the calculation. Initial testing of this change appears promising, but more test runs are necessary before baselining this version of the code.

Another code development was carried out that will improve code performance for unsaturated flow problems. The change improves the convergence for flow problems where the direction of flow is changing rapidly during the simulation.

Software Documentation and QA. Work continued on incorporating test problems into an automated script that fully tests the capabilities of FEHM. These tests cases can be run whenever changes are made to the code to ensure that changes have not impacted the code's performance in unforeseen ways. Supplementary documentation of these test runs is also being written and placed in the V&V report. This testing script and test problems will be reported on as part of Milestone 3470 on verification of FEHM, due at the end of May.

WBS 1.2.3.9.7. Special Studies: ESF Test Coordination. Staff provided multiple-shift field coordination and PI support for ESF North Ramp and Alcove tests. Planning for the Accelerated Thermal Test Program and the Calico Hills Test Program was continued. Participation in the finalization of a thermal test consolidation white paper prepared by SNL was completed.

Geologic Mapping and Consolidated Sampling activities are underway using the mapping gantry. The location in the North Ramp to construct Alcove #2 was identified, and design input was provided. Cross Hole testing by the USGS in Alcove #1 is in progress. Finalization of the test planning records for the P-Tunnel/Calico Hills Field Scale Transport and Flow Test is on schedule.

Work continues on assembling Field Document Records Center files for activities conducted in the North Ramp. This effort includes the maintenance of an administrative database that identifies sample locations and their corresponding photo identifiers.

Administrative-test-management progress reports are generated to assure test requirements are met and issues are identified. ESF TCO Staff sit on both the Field Baseline Change Control Board and the Baseline Change Control Board (level III) on a weekly basis.

Staff will continue to support ESF test-coordination, site-characterization activities in response to Project requirements.

WBS 1.2.5.3.5 Technical Database Input. Staff was completing TDIFs and assigning DTNs to backlogged data.

Staff hosted the second quarterly Technical Working Group Meeting on 5-6 April 1995.

Staff completed Rev. 3 to LANL-YMP-QP-08.3, "Transfer of Data," and the procedure is currently distributed for review comments.

Staff contributed to the review of YMP YAP-SIII.3Q, which is currently under revision.

Staff issued a Los Alamos National Laboratory Memorandum describing the new requirements delineated in the YMP YAP-5.1Q, Rev. 2 to all investigators.

Staff performed a functional review of the proposed YMP Technical Database CD-ROM System. The reviewers were comprised of the Los Alamos Technical Data Coordinator and several investigators. Comments were compiled and submitted to the YMP Technical Database Administrator.

Staff has entered into the ATDT and submitted record packages to the Los Alamos Records Processing Center the following data:

> Report on Neptunium Speciation by NMR and Optical Spectroscopies, DTN LA000000000105.001
>
> Letter Report on the Status of Pu (IV) Colloid Studies, DTN LA000000000118.001
>
> Petrography, Mineralogy, and Chemistry of Calcite-Silica Deposits at Exile Hill, Nevada, in Comparison with Local Springs Deposits, DTN LA000000000094.001

Staff has completed the following Technical Database submissions to the YMSCO Genesis Database:

> Petrography, Mineralogy, and Chemistry of Calcite-Silica Deposits at Exile Hill, Nevada, in Comparison with Local Springs Deposits, DTN LA000000000094.001
>
> Mineralogic Variation in Drill Core UE-25 UZ#16 Yucca Mountain, Nevada" DTN LA000000000086.002
>
> Fracture Lining Minerals in Drill Core UE-25 UZ#16, DTN LA000000000100.002

WBS 1.2.5.6 Site Suitability Evaluation. Staff reviewed a draft of the Technical Basis Report for Surficial Processes, and a draft of a paper on the cosmogenic dating of scarps on the west

side of Yucca Mountain is being revised for possible inclusion in a later draft of the document.

The comment written during the summer on a paper by P.R. Bierman and A.R. Gillespie, "Evidence Suggesting that Methods of Rock-Varnish Cation-Dating Are Neither Comparable nor Consistently Reliable," has been published in Quaternary Research 43, 268-271(1995). The authors are C.D. Harrington and J.W. Whitney.

WBS 1.2.6.1.1 ESF Management, Planning, and Technical Assessments. Staff participated in discussions with the DOE and the design team to merge planned future design packages like 8A into the existing 2C design package. Staff provided design input to support field changes related to the North Ramp Alcove # 2 construction. The draft ESFDR Appendix B Section revision for all ESF Tests based on the Program Plan has completed internal technical review, and preparations were underway for a formal technical review. That technical review has been delayed to allow for inclusions of changes in the Project planning basis resulting from North Ramp Extension and Calico Hills excavation planning. Staff developed weekly and monthly administrative management reports for testing activities and facilitated job package record development. Also, staff provided field-test coordination and administrative support for ESF North Ramp construction.

WBS 1.2.6.1.6 ESF Test Management. Staff supported the development of weekly and monthly administrative management reports for testing activities and facilitated job package record development. Staff provided field-test coordination and administrative support for ESF North Ramp construction and conducted the first phase of the Diesel Study in support of DIE and Design. Staff also reviewed design input developed by the designer based on ESF/TCO design criteria for temporary communications and surface shop facilities to support ESF test activities.

Support of the finalization of Title II Design Packages for the North Portal surface facility and North Ramp Alcove #2 was done, and planning efforts continue for the North Ramp Extension and Calico Hills programs.

WBS 1.2.6.8.4 Integrated Data and Control System. Staff were actively pursuing integration and review of data flow requirements that are implemented and controlled by test-planning records and Project procedures. At the request of YMSCO, staff developed a planning cost estimate for a participant-provided, data-collection system for the ESF. Staff continued the review of field record submissions, and facilitated data transfers to the construction and test organizations.

WBS 1.2.11.2/.3/.5 Quality Assurance Program Development, Verification and Engineering. Los Alamos staff continued conversations with the M&O concerning transitioning to their team. A meeting was held at LLNL on 26 April to discuss the specifics of this transition. Staff also continued to transition audit functions to the DOE. A Q team meeting was held 12 April. Issues dealt predominantly with the upcoming DOE audit and procedure revisions as a result of transitioning audits to DOE. Staff also started a work-process examination. The formspk module, which provides selected forms on our network,

has been tested and released for two procedures; forms for the remaining procedures are now being tested. Efforts to develop a linked distribution list have been completed and the program is now being tested.

The draft version of the new DOE trending procedure was reviewed. A procedure to control ESF field work is in preparation. Paul Gillespie and Betty Romero continued to review procedures to determine the impact of the transfer of audit functions to DOE. The following detailed technical procedures have been released: DP-611, R0 (Use of Garmin GPS 100 for location of volcanic features); DP-104, R0 (Electrical Conductivity of Aqueous Solutions); and DP-79, R1 (Liquid scintillation counting of samples).

Steve Bolivar attended a PQAC meeting at LLNL on 26 April.

The Orientation Plan was in review, and efforts are underway to fix the bugs in the training database software. The Software Coordinator installed a CD-ROM for the technical database coordinator. Other machines were reconfigured with the new Air Connect TCP/IP software, which should allow better Internet connectivity.

Audit reports AR-EES-1-95-03 and AR-EES-4-95-04 were released; no corrective action reports were issued. An audit of volcanism activities (AR-EES-13/LV/VOL) was begun. Staff will initiate five more audits in May. A survey to evaluate training in the Chemical and Sciences and Technology (CST) division of LANL was initiated.

There were 12 open internal corrective action reports (CARs); six of these were awaiting verification. They were no open DOE CARs.

The Software Management Coordinator continued to upgrade network hardware. The two new pieces of software were in comment resolution, and GZSOLVE baseline closures were reviewed.

YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant:	LANL		**MONTHLY COST/FTE REPORT**				Fiscal Month/Year April FY1995	
Date Prepared:	11-May-95						Page 1	
							Fiscal Year 1995	
WBS Element	Actual Costs	Participant Hours	Subcon Hours	Purchase/Subcon Commitments	Accrued Costs*	Approved Budget	Approved Funds	Cumulative Costs
1.2.1	1.8	0.0	20.7	0.0	0.0	100.0	75.0	14.8
1.2.3	928.4	6,150.4	1,358.9	853.8	0.0	12,764.0	7,223.0	7,832.9
1.2.5	189.0	1,184.0	311.8	64.8	0.0	1,544.0	1,158.0	793.1
1.2.6	154.9	1,420.8	311.9	102.0	0.0	2,423.0	2,000.0	804.9
1.2.9	58.2	659.2	-127.3	100.4	0.0	1,103.0	828.0	499.2
1.2.11	78.7	155.2	5.8	377.5	0.0	1,300.0	975.0	634.3
1.2.12	23.0	8.0	0.0	173.5	0.0	477.0	280.0	223.6
1.2.13	2.6	0.0	0.0	16.4	0.0	111.0	85.0	22.0
1.2.15	46.5	168.0	171.9	48.6	0.0	483.0	255.0	271.9
Totals	1,483.1	9,745.6	2,053.7	1,737.0	0.0	20,305.0	1	

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: IORII WBS: 1.2.9.1.2.1

WBS TITLE: PARTICIPANT TECHNICAL PROJECT OFFICE

P&S ACCOUNT: 0A9121

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
335	335	236	0	0.0	100	-99	29.6	141.9	603	534	69	11.4	425	89.9

Analysis

Cumulative Cost Variance:

This variance is primarily due to the loss of key staff and delays in replacing them. The replacement of these personnel and other temporary support personnel is expected to reduce this variance.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

This variance will be reduced as costs for recently hired personnel are charged to this account.

K.A.West for J.A.Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

K.A.West for J.A.Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: WATERS WBS: 1.2.6.8.4

WBS TITLE: Exploratory Studies Facility (ESF) Test Management

P&S ACCOUNT: 0A684

FY 1995 Cumulative to Date								
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI
650	640	540	-10	-1.5	98.5	100	15.6	118.5

FY 1995 at Completion					
BAC	EAC	VAC	VAC%	IEAC	TCPI
1122	1045	77	6.9	947	95.4

Analysis

Cumulative Cost Variance:

Lack of personnel to support this account has been contributing to this variance. Extended work weeks for existing personnel have been implemented and will result in reducing this variance in the future.

Cumulative Schedule Variance:

(Not reportable.)

Variance At Complete:

Extended work weeks for existing personnel to offset a delay in hiring new personnel will result in a reduction in this variance.

Kevin C. West for J.A. Canepa 5/15/95 Kevin C. West for J.A. Canepa 5/15/95

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: WATERS WBS: 1.2.6.8.4

WBS TITLE: Integrated Data Systems

P&S ACCOUNT: 0A684

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
231	231	126	-0	-0.0	100	-105	45.5	183.3	397	337	60	15.1	217	78.7

Analysis

Cumulative Cost Variance:

This variance is due to delayed invoicing on a sub-contract under this account and delayed hiring of personnel to support this activity. This variance will be reduced as the costs for recently hired personnel are charged to the account and invoices are processed for work performed under the subcontract.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

This variance will be reduced as invoices are processed and newly hired personnel begin to charge to the account.

H.L.West for J.R.Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.L.West for J.R.Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: SMISTAD WBS: 1.2.5.4.9

WBS TITLE: DEVELOPMENT & VERIFICATION OF FLOW & TRANSPORT CODES

P&S ACCOUNT: 0A549

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
573	574	702	1	0.2	100.2	-128	-22.3	81.8	1000	1081	-81	-8.1	1222	112.4

Analysis

Cumulative Cost Variance:

This cost variance appears to be caused by improper distribution of labor within the activities in this account and improper charges to this account for work being performed under account 0A34151. The distribution of costs will be examined and appropiate adjustments made to reduce this variance.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

This variance will be reduced as work is recharged to the proper accounts.

H.W. West for J.C. Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.W. West for J.C. Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: SIMMONS WBS: 1.2.3.4.1.4.1

WBS TITLE: Dynamic Transport Column Experiments

P&S ACCOUNT: 0A34141

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
495	440	598	-55	-11.1	88.9	-158	-35.9	73.6	883	862	21	2.4	1200	167.8

Analysis

Cumulative Cost Variance:

The cost variance shown under this account is due to the labor intensive effort required to prepare the experiments for the activities. When the preparations are completed the effort is primarily a maintenance and monitoring task. This requires much less personnel participation and will result in a reduction in this variance.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

(not reportable)

J.West for J.Carepa 5/15/95
P&S ACCOUNT MANAGER DATE

J.West for J.Carepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL **PEM:** SIMMONS **WBS:** 1.2.3.4.1.4.2

WBS TITLE: DIFFUSION

P&S ACCOUNT: 0A34142

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
263	499	358	236	89.7	189.7	141	28.3	139.4	705	719	-14	-2.0	506	57.1

Analysis

Cumulative Cost Variance:

The variance on this account is due to delays in the billing cycle for a capital equipment item. The variance will be corrected when the cost is billed and reported in the accounting system.

Cumulative Schedule Variance:

Delays in the procurement process for a capital equipment item are responsible for this variance. No schedule impact for this account is anticipated due to this variance.

Variance At Complete:

(Not reportable)

H Wheet for JA Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H Wheet for JA Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: NESBIT WBS: 1.2.3.9.7

WBS TITLE: ESF and SB Test Coordination

P&S ACCOUNT: 0A397

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
805	808	503	3	0.4	100.4	305	37.7	160.6	1397	1291	106	7.6	870	74.7

Analysis

Cumulative Cost Variance:

Delays in hiring TCO staff and TBM operations are the major contributors to the cumulative cost variance for this account. Extended work week plans have been implemented to expedite the work. Efforts to reduce this variance are continuing.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

This variance is expected to be reduced through the continued use of extended work weeks.

H.L.West for J.L.Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.L.West for J.L.Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: SIMMONS WBS: 1.2.3.4.1.3.1

WBS TITLE: DISSOLVED SPECIES CONCENTRATION LIMITS

P&S ACCOUNT: 0A34131

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
590	609	643	19	3.2	103.2	-34	-5.6	94.7	975	875	102	10.5	1030	159.1

Analysis

Cumulative Cost Variance:

(Not reportable)

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

The major contributor to this variance is the lag in processing the invoices related to the purchase of capital equipment under this account. This variance will be reduced as these invoices are processed.

K.W. West for J.R. Canega 5/15/95
P&S ACCOUNT MANAGER DATE

K.W. West for J.R. Canega 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: SIMMONS WBS: 1.2.3.4.1

WBS TITLE: Ground Water Chemistry Model

P&S ACCOUNT: 0A3411

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
194	122	51	-72	-37.1	62.9	71	58.2	239.2	371	298	73	19.7	155	100.8

Analysis

Cumulative Cost Variance:

The cost variance shown for this account is due to delays in placing the contract for the work and response time in the LANL billing and accounting systems.

Cumulative Schedule Variance:

No schedule impact is anticipated since the work is being replanned to offset this variance.

Variance At Complete:

This variance is expected to be reduced as the invoices for work done are processed.

H.L.West for J.F.Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.L.West for J.F.Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: PATTERSON WBS: 1.2.3.3.1.2.6

WBS TITLE: Gaseous-Phase Movement in Unsaturated Zone

P&S ACCOUNT: 0A33126

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
159	165	288	6	3.8	103.8	-123	-74.5	57.3	274	318	-44	-16.1	478	363.3

Analysis

Cumulative Cost Variance:

The work being performed under this account is being completed considerably ahead of schedule. The cost variance will be reduced due to the early completion.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

(Not reportable)

H.L. West for J.J. Carrega 5/15/95
P&S ACCOUNT MANAGER DATE

H.L. West for J.J. Carrega 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: DULUGOSZ WBS: 1.2.3.3.1.2.1

WBS TITLE: UNSATURATED ZONE INFILTRATION

P&S ACCOUNT: 0A33121

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	TEAC	TCPI
200	200	234	0	0	100	34	-17	85.5	200	277	-77	-38.5	234	0.0

Analysis

Cumulative Cost Variance:

(Not reportable)

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

The work being performed under this account is essentially complete. No further costs are anticipated against the account.

H.L.West for J.L.Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.L.West for J.L.Canepa 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: NESBIT WBS: 1.2.3.2.5.5.1

WBS TITLE: CHARACTERIZATION OF VOLCANIC FEATURES

P&S ACCOUNT: 0A32551

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
229	153	262	-76	-33.2	66.8	-109	-71.2	58.4	410	419	-9	-2.2	702	163.7

Analysis

Cumulative Cost Variance:

The variance on this account is primarily due to unplanned work being performed at the request of the DOE. This work was performed by participating in the Expert Judgement Activity, and participation in the NRC Site Visit. The work is currently being examined to determine if this variance can be corrected by replanning.

Cumulative Schedule Variance:

This variance is due to unplanned work as described above. Replanning is being examined as a possible alternative to correct the variance.

Variance At Complete:

(Not reportable)

H.W. West for J.T. Canepa 5/15/95
P&S ACCOUNT MANAGER / DATE

H.W. West for J.T. Canepa 5/15/95
TPO / DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: APRIL 1995

PARTICIPANT: LANL PEM: SIMMONS WBS: 1.2.3.2.1.2.2

WBS TITLE: KINETICS AND THERMODYNAMICS OF MINERAL EVOLUTION

P&S ACCOUNT: 0A32122

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
220	220	77	0	0	100	143	65	285.7	377	225	152	40.3	132	106.1

Analysis

Cumulative Cost Variance:

The cost variance shown for this account is due to the lag in billing for work performed by two subcontractors working under this account and the reporting of these costs in the LANL accounting system. This variance will be corrected as these costs are reported.

Cumulative Schedule Variance:

(Not reportable)

Variance At Complete:

This variance will be corrected as the subcontractor invoices are processed and the costs are reported in the LANL accounting system.

H.L. West for J. Canepa 5/15/95
P&S ACCOUNT MANAGER DATE

H.L. West for J. Canepa 5/15/95
TPO DATE

Copy to:

YMPO	J. R. Dyer
YMPO	S. B. Jones
YMPO	S. J. Brocoum
YMPO	R. L. Craun
YMPO	D. R. Williams
YMPO	J. M. Replogle
YMPO	P. D. Stucker
YMPO	V. F. Iiori
YMPO	W. N. Kozai
YMPO	W. J. Boyle
YMPO	J. T. Sullivan
YMPO	M. C. Tynan
YMPO	R. V. Barton
YMPO	A. V. Gil
NRC	C. Glenn
M&O/TRW	S. J. Bodnar
M&O/FD	E. M. Fortsch
M&O/TRW	R. K. St. Clair
M&O/TRW	L. D. Foust
M&O/TRW	D. B. Able
ORNL	R. B. Pope
LANL	J. A. Canepa
LLNL	W. L. Clarke
USGS	L. R. Hayes
REECO	D. L. Koss
SAIC	M. D. Voegele
WESTON	R. D. Dresser
RW-133	C. W. Conner
6300	F. W. Bingham
6314	M. C. Brady
6115	P. B. Davies
6312	H. A. Dockery
6313	L. S. Costin
6319	R. R. Richards
6352	S. E. Sharpton
6352	E. M. Edge
6352	D. E. Hampton
6352	A. P. Hotchkiss
6352	L. Lechel
6302	31/1292/MGMT/1.3/NQ
YMP CRF	

ENCLOSURE 8

Sandia National Laboratories

P.O. Box 5800
Albuquerque, New Mexico 87185-1325

Managed and Operated by Sandia Corporation
a subsidiary of Martin Marietta Corporation

Laurence S. Costin, Acting Manager
YMP Management Department, MS1325

LV.370203.A1

May 15, 1995

WBS: 1.2.9.2
QA: NA

Mr. Wesley E. Barnes, Project Manager
Yucca Mountain Site Characterization
Project Office
U. S. Department of Energy
Nevada Operations Office
Las Vegas, NV 89193-8608

Subject: Monthly Progress Report - April 1995

Dear Mr. Barnes:

Enclosed is the input from Sandia National Laboratories for the April 1995 Monthly Progress Report. The sections on progress, issues, and deliverables/milestones were telecommunicated to Julie Dobbins on May 15, 1995. The variance reports were faxed to Bob Spiro on May 15, 1995.

You may contact or David Hampton at (505) 848-0849 if there are any questions.

Sincerely,

Laurence S. Costin

LSC:6313:deh
Attachments: As stated.

939
cc: See cc list (14)
w/o cc: Cook
cc: Dyer
cc: Adams
cc: Spence
cc: Whitney
cc: Hanton w/a
cc:

RECEIVED

SANDIA NATIONAL LABORATORIES

YUCCA MOUNTAIN PROJECT

MONTHLY PROGRESS REPORT

APRIL 1995

DISCLAIMER
Quality assurance checks on data contained or referenced in this report have been performed only to determine that the data have been obtained and documented properly. The SNL Project Department 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. Milestones have been baselined and are included to show status.

1.2.1 Systems Engineering

Progress During Report Period

Provide Analysis Support to M&O Systems Studies:

There is still no explanation for the lack of correspondence between the JAC (elastic) results and the STRES3D results completed for the package 2C work. It was hoped that this issue would be resolved prior to the development of the 3-D jointed rock model. The only remaining avenue to examine is the far-field correspondence between the models. SNL is currently working on comparing the 2 sets of results. Should the far-field comparison prove acceptable, SNL will proceed with the jointed-rock calculation called for in this study. If there is no acceptable far-field agreement, this activity may need to be re-negotiated.

1.2.3 Site Investigations

Progress During Report Period

Systematic Acquisition of Site-Specific Subsurface Information:

Drilling at SD-7 remained suspended at a temporary depth of 1,602' during 4/95. Geologic logging of core from SD-7 has been completed to approximately 1,200', and preliminary logs have been obtained to the current TD of 1,602'. Logs for the first 1,000' are still in technical review. These logs should be submitted as SNL Level 3 Milestone 0S32221M31 in 5/95. Overextension of staff resources combined with the logistics of computer-graphics production delayed this scheduled 4/28/95 milestone. Further submittals under planned milestones will be delayed pending resumption of drilling, and the scope of the deliverables may need to be revised depending upon drilling progress and/or early termination of the hole. No firm date has been established to resume drilling at SD-7, and the availability of rig-crew resources appears linked to progress at UZ-7A.

A revised and expanded version of the geologic log for SD-9 was submitted on 4/12/95, completing SNL Level 3 Milestone 0S32221M22. Additional revisions will be submitted to incorporate late-arriving material properties and engineering data. This log and TDIF supersede the preliminary geologic log for SD-9 through 980'.

Drilling SD-12 remained suspended during 4/95 at a temporary total depth of 1,435'. Drilling at SD-12 is currently scheduled to resume after UZ-7A reaches approximately 750' and after sufficient new dual-wall drill pipe has been received by YMSCO. Current estimates for the resumption of drilling at SD-12 are 5/1/95.

Three-Dimensional Rock Characteristics Models:

Sandia letter report (SLTR94-0002) entitled "Two-Dimensional Model of Rock Structural

Indices Along the North Ramp," which summarizes geometric and geostatistical modeling of rock-quality data from the ESF North Ramp drill holes using the Lynx geotechnical modeling system, remains in final SNL management review. We note that the principal conclusions of this letter report are being confirmed by the tunnel-boring machine (TBM), which has now penetrated some 150' into the upper Tiva Canyon Tuff. Extensive fracturing and the presence of large voids, which are reflected in the modeled rock-quality indices, have slowed tunnelling progress markedly in recent days. The interpretation of the models presented in this report is that similar poor ground conditions will be encountered by the TBM along much of the projected trace of the North Ramp.

Available porosity data were examined to define the geohydrologic units that will be used in the simulated material property models input to ground water travel time (GWTT)-95 flow-and-transport calculations. Porosity data, including both qualified ("new") and nonqualified ("old") values, were grouped into seven geohydrologic units by aggregating various of the 40-plus lithologic units currently identified in the Lynx subregional model. Further analysis suggested that significant differences exist between the qualified and nonqualified data for some of these aggregated units. Reevaluation of only the qualified porosity data suggests the presence of nine separate units. Although we have tentatively decided to discard the older, unqualified porosity data as conditioning information for material-property modeling, the increased spatial uncertainty that may result from the geographically more-restricted conditioning data suggests that we will need to conduct a sensitivity analysis using the qualified and combined data sets before reaching a final decision. Output files containing the unit-boundary coordinates and data for one of the four GWTT cross sections have been extracted from the Lynx model and these are being used to develop the prototype simulated models that will be tested by PA analysts. This work supports SNL Level 3 Milestones 0S32222M41 and M42.

The Lynx-GSLIB integration module (GLINTMOD) passed a critical test late in the month, moving this material-properties modeling approach from the prototype stage, using a simulated Lynx output file, to the quasi-production stage, using an actual Lynx output file exported from the subregional model. An unconditioned geostatistical model (i.e., using no explicit drillhole data) was generated that successfully replicated the general geometric appearance of one of the cross sections to be modeled for the unsaturated part of the GWTT-95 flow-and-transport calculations. Porosity values varied laterally in a qualitatively appropriate manner, and no grossly incorrect interfingering of rock types were observed, unlike other, poorly conditioned profiles created as part of earlier TSPA-93 modeling. This initial model has been provided to the GWTT staff for examination and testing, even as efforts continue to refine the proper search and anisotropy orientation parameters. Determination of these parameters is complicated by the fact that this implementation of GLINTMOD uses a 3-D search but produces only 2-D property models in the interest of saving computational time and the intended use of 2-D flow-and-transport calculations in GWTT-95. A significant effort was devoted to resolving problems related to the fact that the contents of the actual Lynx export file containing the soft geologic information differed in detail from the paper description provided by the vendor, Lynx Geosystems, which had been

used to create the simulated file used in the prototype testing. Work during 5/95 will focus on developing software documentation and a report describing the prototype modeling effort (SNL Level 3 Milestone 0S32222M71). Continuing work to improve the realism of the simulated property models will be conducted largely under the "user" GWTT activities of this WBS element.

Last month, porosity and saturation logs were computed using geophysical well logs. We are continuing to compute these logs for an expanded suite of drill holes including several of the NRG-series holes, and we are systematically evaluating these computed logs against corresponding core-sample measurements. We anticipate that this technique will markedly increase the spatial distribution of conditioning data and result in improved material property models. Additionally, the logging of older, pre-SCP drillholes under QA procedures could result in making qualified data available at otherwise unqualified locations. Potentially, the requirement for core in all repository-block drillholes might be relaxed as well. This exploratory work will continue, and the results will be incorporated as appropriate into models used to support SNL Level 3 Milestones 0S32222M11, M12, M41, and M42.

Surface Facilities Exploration Program:

SNL Level 3 Milestone 0S12, "North Ramp Geotechnical Report," was submitted to YMSCO on 4/29/95.

Surface Facilities Laboratory Tests and Material Properties Measurements:

SNL Level 3 Milestone 0S32622M11, "Muck Conveyor Foundation Soils Tests TDIF," was submitted to YMSCO on 4/28/95.

Surface Facilities Field Tests and Characterization Measurements:

Structural logging was completed for SD-7, SD-12, and UZ-14.

Laboratory Thermal Properties:

SNL continued measuring thermal conductivity of samples taken from NRG-4, NRG-5, and NRG-7.

SNL is continuing development of equipment to measure heat capacity. Currently, work is focused on development of a sample container that seals effectively, with good contact with the specimen, but that does fail under the thermal stress associated with heating tuff samples.

Laboratory Thermal Expansion Testing:

SNL continued measuring thermal expansion of samples taken from NRG-4, NRG-5, and NRG-7.

A study to investigate the effects of confining pressure on thermal expansion is continuing. Experiments in the past on unconfined samples have resulted in unexpectedly high values for thermal expansion. These high values have been associated with silica phase transformations. This study is designed to determine if confining pressure will suppress the unexpectedly high values. Equipment to conduct these experiments was assembled, and initial calibration runs conducted.

Laboratory Determination of Mechanical Properties of Intact Rock:

Study Plan 8.3.1.15.1.3, entitled "Laboratory Determination of the Mechanical Properties of Intact Rock," was revised and submitted to YMSCO on 4/12/95.

In the study of the mechanical properties of drillhole samples at NER, test specimens from SD-9, depth range 53'-231', and SD-12, depth range 16'-1,300', have been and are being prepared for three investigations. 1 group of samples will be tested at the baseline conditions for the analysis of lateral variability of mechanical properties, a second group of samples will be used in elevated pressure experiments in order to continue the investigation of pressure effects, and a third group of samples will be tested to study the effects of elevated temperature on the mechanical properties of welded Topopah Spring tuff.

In the study of the creep mechanical properties of drillhole samples at NER, samples from NRG-7/7A have been prepared for the initial series of experiments. The samples selected are all from the repository horizon (i.e., thermal/mechanical unit TSw2) and are tested room dry. 1 experiment, with a constant differential stress of 130 MPa, was started in 2/95 and continued into 4/95, when the experiment was terminated with no creep strain being observed. 3 additional experiments, with constant differential stresses of 40, 70, and 100 MPa, were initiated in 3/95 and continued through 4/95. These experiments are all being performed at 225°C and 10 MPa confining pressure. A preliminary evaluation of the data in-process has indicated no significant creep strain accumulation in any of the experiments.

Laboratory Determination of Mechanical Properties of Fractures:

Study Plan 8.3.1.15.1.4, "Laboratory Determination of the Mechanical Properties of Fractures," was revised and resubmitted on 4/11/95.

In the study of the mechanical properties of fractures from drill holes, natural fractures from NRG-7 have been tested and the scientific notebook detailing the study is being completed, and a group of samples from SD-9 have been received for testing. In 4/95, 5 of the SD-9 samples were tested in normal compression and then in shear at normal stresses of 5 and 10 MPa. All 5 of these samples are from the TSw2 thermal/mechanical unit. Several additional test specimens were prepared from SD-9 for testing and the surfaces profiled.

In Situ Thermomechanical Properties:

The DOE had directed SNL to lead a multi-participant team to develop a consolidated thermal test strategy for thermal tests to be conducted in the ESF. This month, SNL continued to numerically model the tests proposed in the report, in order to advance the design of the tests. The tests proposed in the paper are designed to meet the data needs that must be met by the thermal test program to meet the 1998 technical site suitability determination requirements and the 2001 initial license application. These needs were identified through discussions with the future users of this data in repository design, pre- and postclosure performance assessment, waste package design, and licensing.

Work was continued on extending the proposal to consider additional data needs that must be met between 2001 and 2008.

In Situ Mechanical Properties:

This month SNL continued drafting the Study Plan that will govern this study.

In Situ Design Verification:

SNL continued to monitor the rock bolt load cells installed in the ramp, starter tunnel alcove, and the high wall face. SNL also continued to monitor the multi-point extensometers (MPBXs) installed in the north ramp and starter tunnel alcove and made cross-drift convergence measurements. Readings from these instruments have not indicated any tunnel stability concerns.

SNL staff continued installing strain gages on the steel sets that form the support of portions of the North Ramp. By the end of 4/95, strain gages were installed on 25 steel sets. Convergence pin arrays were installed at the locations where steel sets were instrumented to measure any cross-drift convergence.

Ground Motion from Regional Earthquakes and Underground Nuclear Explosions:

SNL prepared for and participated in the Ground Motion Data Needs Workshop for the Yucca Mountain probabilistic seismic hazard analysis. SNL's presentation focused on ground motions from underground nuclear explosions, with emphasis on motions recorded at Yucca Mountain and on some of the analyses that have been performed on the explosion ground motion data. These analyses include estimation of ground motion derived from 2-D crustal structure modeling, and development of a preliminary 2-D velocity model for the uppermost 350 meters of Yucca Mountain using surface and downhole recording of nuclear explosions.

Retardation Sensitivity Analysis:

Benchmarking calculations similar to those performed previously with HYDROGEOCHEM and an earlier version of LEHGC were completed with LEHGC Version 1.1. Three new sample problems were also designed. These include 1) tracer transport through a fracture with matrix diffusion, 2) cation exchange and diffusion through a bentonite backfill, and 3) transport of Th by silica colloids.

As a result of efforts to debug the code, a revised version of the LEHGC1.1 code was provided to SNL by the main author. Differences between the previous version and the new version are not insignificant. Test cases previously run with the earlier version were rerun with the new version. This extra work will delay completion of the manual by several weeks. A revised date of 5/30/95 has been proposed for SNL Level 3 Milestone 0S34151M11.

Future Regional Climate and Environments:

Qualified release of the Genesis Global Climate Model has been issued. 4 of the 6 control points in establishing a software baseline for the model have been reached.

Sealing Testing:

A detailed criteria letter outlining the requirements for borehole sealing was completed in 4/95. This criteria letter defined tests at 2 locations near Yucca Mountain, South Fran Ridge (TSw2), and upper Drillhole Wash (Ptn). These units are the target horizons for borehole seals above the proposed repository. Site support activities including permitting, surface pad preparation, borehole drilling, etc., are triggered by this criteria letters.

1.2.5 Regulatory

Progress During Report Period

Integrate Process-Level (PL) - Performance-Assessment (PA) Investigations:

A homogeneous three-dimensional model of the Fran Ridge Tracer test was developed. The equivalent continuum model and the dual permeability model were compared using TOUGH2. Initial results indicate that only the dual permeability model will be able to replicate the fracture flow propagation that was observed in the test. Continuing efforts are being made to refine the model and add heterogeneities.

Primary efforts related to scaling and heterogeneity have focused on the comparison of results of numerical and physical up-scaling experiments. Gas permeability measurements were made on a block of Paintbrush Tuff, Tiva Canyon Caprock microstratigraphic unit, at

five different measurement scales spanning four orders of magnitude on a volumetric basis. Using the finest scale measurements, various models were used to up-scale the data. Scaling models employed include simple arithmetic, geometric, and harmonic averaging, a perturbation method, renormalization methods, and an inverse numerical technique. In general, comparison of the predicted and measured up-scaling fields differed. There are a number of possible reasons for the noted discrepancies. Future efforts will focus on determining the reason for the differences as well as performing similar tests but with different rocks.

Define Reference Hydrologic Cases for Calculations:

Work has been finished on distillation of the "Nominal Flow" scenarios to identify the so-called base cases. Staff has written a definition of the expected evolution of the repository environment in order to provide a background against which to select scenarios. The elements in the Nominal Flow scenarios describing degradation of the EBS and saturated/unsaturated mobilization of contaminant have been expanded into more detail than earlier resulting in a possible combination of elements totaling about 2500. The intent of "base cases" is to provide the most likely to occur problems in sufficient detail to allow explicit calculations closely representing future repository behavior. Twelve extended scenarios have been constructed which are believed to meet the requirements of being typical and reference cases. A rough draft of the memorandum report was submitted for informal technical review on 4/18/95.

Develop Tectonic Subsystem TSPA Model:

As a result of a meeting with USGS personnel, staff developed a conceptual model of how earthquake, fault movement, and creep deformation could affect long-term repository performance. Primary concerns are the tectonic impacts on EBS integrity and radionuclide pathways to the accessible environment (or biosphere).

For EBS integrity, the concerns are seismic or thermally induced rockfall and the displacement, shearing, or crushing of containers. In regard to shearing, staff wrote a subroutine (FAULTY) that generates a random linear fault across the potential repository and then estimates the number of containers intersected by the fault. Rockfall is important because it adds thermal insulation to the containers, it allows new water pathways, and it can cause direct damage to containers.

For radionuclide pathways, the concerns revolve around changes in permeabilities, specifically how changes in the stress field within Yucca Mountain can alter weep flow and cause changes in the water-table elevation, and how thermal effects can open fractures or even new faults. Some potential tectonic effects postulated by staff were discounted by the USGS personnel and are not included in the conceptual model; e.g., fault movement that could cause structural changes that could significantly change the water-table elevation.

Site Performance Assessment:

SNL Level 3 Milestone 0S544M11, "SAND Rpt, FY94 GWTT Calculations," was submitted to YMSCO on 4/28/95.

Flow and Transport in Discrete Fractures:

Reduction and analysis of 3-D fracture data collected during the Fran Ridge Infiltration study was conducted this month.

DELIVERABLES COMPLETED THIS MONTH

EVENT	WBS NUMBER	DUE DATE	EXPECTED DATE	COMPLETED DATE	SLIP	DESCRIPTION	COMMENTS
15M31	1.2.1.5	28-APR-95	28-APR-95	28-APR-95	0	Submit Memo Rpt, PA Analysis for System Studies.	
32221M22	1.2.3.2.2.2.1	09-MAR-95	11-APR-95	12-APR-95	24	Submit TDIF Data Transfer for SD-9, to TD.	Late material properties & engineering data.
0S12	1.2.3.2.6.2.1	29-APR-94	14-APR-95	14-APR-95	239	SAND Rpt Summary of Data Collection and Analysis for NRG holes.	Delayed by higher priority work.
32622M11	1.2.3.2.6.2.2	23-DEC-94	14-APR-95	28-APR-95	84	Muck Conveyor Foundation Soils Tests TDIF.	Delayed criteria from M&O.
31M22	1.2.3.11.2	01-MAY-95	01-MAY-95	27-APR-95	EARLY	Report 3.9.01.2, Phase I: Results of RAAX.	
4232M37	1.2.4.5	28-APR-95	28-APR-95	28-APR-95	0	Submit Focused ACD Assumptions Substantiation.	
541M31	1.2.5.4.1	28-APR-95	28-APR-95	21-APR-95	EARLY	Memo Rpt, Identify Expected Cases for PA.	
544M11	1.2.5.4.4	01-DEC-94	28-APR-95	28-APR-95	100	SAND Rpt, FY94 GWTT Calculations.	Delayed by higher priority work.
B1M02	1.2.11.1	15-APR-95	15-APR-95	15-APR-95	0	Quarterly QA Activities Status Report.	

DELIVERABLES PAST DUE

EVENT	WBS NUMBER	DUE DATE	EXPECTED DATE	COMPLETED DATE	SLIP	DESCRIPTION	COMMENTS
OS69	1.2.1.5	15-JUN-94	30-AUG-95		303	Report on Backfill Thermal Conductivity Exper.	Unavailability of key personnel.
32221M12	1.2.3.2.2.2.1	29-NOV-94	20-SEP-95		202	Submit TDIF Data Transfer for SD-12, 2000 feet.	SD-12 drilling has been delayed.
32221M13	1.2.3.2.2.2.1	09-JAN-95	20-SEP-95		179	Submit TDIF Data Transfer for SD-12, to TD.	SD-12 drilling has been delayed.
32221M14	1.2.3.2.2.2.1	30-MAY-95	19-FEB-96		179	Submit SD-12 Summary Report.	SD-12 drilling has been delayed.
32221M31	1.2.3.2.2.2.1	14-NOV-94	12-MAY-95		121	Submit TDIF Data Transfer for SD-7, 1000 feet.	SD-7 drilling has been delayed.
32221M32	1.2.3.2.2.2.1	16-JAN-95	30-JUN-95		118	Submit TDIF Data Transfer for SD-7, 2000 feet.	SD-7 drilling has been delayed.
32221M33	1.2.3.2.2.2.1	17-FEB-95	30-JUN-95		94	Submit TDIF Data Transfer for SD-7, to TD.	SD-7 drilling has been delayed.
32221M34	1.2.3.2.2.2.1	30-MAY-95	29-SEP-95		86	Submit SD-7 Summary Report.	SD-7 drilling has been delayed.
32621M12	1.2.3.2.6.2.1	01-FEB-95	01-JUN-95		85	Main Drift Geotechnical Report.	SD-7 drilling has been delayed.
32621M21	1.2.3.2.6.2.1	01-FEB-95	01-JUN-95		85	SLTR Documenting Core Logging Procedures.	Expansion of scope. Approved by Mark Tynan.
32623F12	1.2.3.2.6.2.3	01-FEB-95	15-MAY-95		73	Main Drift Cross Section.	SD-7 drilling has been delayed.
32623F14	1.2.3.2.6.2.3	30-NOV-94	15-MAY-95		112	Develop Geologic and Structural Logs for SD-7.	SD-7 drilling has been delayed.
32623F18	1.2.3.2.6.2.3	23-DEC-94	15-MAY-95		95	Develop Rock Quality Estimates for SD-7.	SD-7 drilling has been delayed.
32623F19	1.2.3.2.6.2.3	23-DEC-94	15-MAY-95		95	Develop Rock Mass Mechanical Properties F/sd-7.	SD-7 drilling has been delayed.
OS91	1.2.3.2.7.1.2	15-SEP-94	16-MAY-95		165	Report on Thermal Expansion Data.	Unavailability of key personnel.
OS94	1.2.3.2.7.1.2	30-SEP-94	16-MAY-95		154	Report on Data Analysis for Thermal Properties.	Unavailability of key personnel.
32713M31	1.2.3.2.7.1.3	28-APR-95	30-JUN-95		44	TDIF on Mech Prop Exp's, SD-12 (OS105).	SD-12 drilling has been delayed.
32714M31	1.2.3.2.7.1.4	28-APR-95	30-JUN-95		44	TDIF, Mech Prop's of Frac's from SD-12.	SD-12 drilling has been delayed.
42111M11	1.2.3.2.7.3.1	30-NOV-94	15-SEP-95		198	Progress Rpt, NR Access Convergence Test Design.	Diversion of effort to Consolidated Thermal Test Plan.
42112M11	1.2.3.2.7.3.2	30-AUG-94	29-NOV-95		62	Submittal of Final In Situ Thermomech Props SP.	Diversion of effort to Consolidated Thermal Test Plan.
42112M12	1.2.3.2.7.3.2	29-NOV-94	24-AUG-95		184	Submittal of Draft In Situ Thermomech Props SP.	Diversion of effort to Consolidated Thermal Test Plan.
4212M21	1.2.3.2.7.4	18-AUG-95	01-SEP-95		10	Submit Rpt, Lab-Scale Exp's, Jointed Rock Models.	Additional tests required.

DELIVERABLES PAST DUE (continued)

EVENT	WBS NUMBER	DUE DATE	EXPECTED DATE	COMPLETED DATE	SLIP	DESCRIPTION	COMMENTS
32833M11	1.2.3.2.8.3.3	30-MAY-95	30-JUN-95		23	SAND Rpt, Earthquake Grd Motion Model Sum (OS80).	Failure to place UTEP contract on time.
34151M11	1.2.3.4.1.5.1	01-MAY-95	30-MAY-95		20	LEHGC1.1 User's Manual & QA Documentation.	Re-run test case with new code version.
36216M11	1.2.3.6.2.1.6	10-AUG-95	13-NOV-95		60	SAND Rpt, Climate Model Validation.	RegCM2 data problem.
36216M21	1.2.3.6.2.1.6	16-MAR-95	08-JUN-95		59	SAND Rpt, Bounding Conditions Future Climate.	RegCM2 data problem.
461M11	1.2.3.13.1	12-JAN-95	31-AUG-95		163	Sealing Requirements and Assumptions Initial Rpt.	Delayed North Ramp Construction.
461M12	1.2.3.13.1	29-JUN-95	31-AUG-95		44	Sealing Requirements and Assumptions Final Rpt.	Delayed North Ramp Construction.
461M21	1.2.3.13.1	03-FEB-95	22-DEC-95		225	SLTR, North Ramp Seal Conceptual Design.	Delayed North Ramp Construction.
4232M11	1.2.4.5	15-MAR-95	29-SEP-95		139	SLTR, SBD Development Strategy & Planning Doc.	Diversion of effort to Consolidated Thermal Test Plan.
541M11	1.2.5.4.1	03-APR-95	15-SEP-95		116	SAND Rpt, Initial TSPA Subsystem Modeling.	Delayed by Calico Hills.
541M51	1.2.5.4.1	31-MAR-95	18-AUG-95		98	Memo Rpt, Modeling Results for TSS Documentation.	Delayed by Calico Hills.
541M71	1.2.5.4.1	01-SEP-95	15-SEP-95		9	Submit Memo Rpt, TSPA Analysis.	Forecasted additional requirements.
541M81	1.2.5.4.1	14-AUG-95	22-DEC-95		91	SLTR, Mech Influence on Coupling.	Unavailability of key personnel.
541N11	1.2.5.4.1	14-APR-95	31-AUG-95		97	Submit all Site Characterization Memoranda.	Unavailability of key personnel.
544M31	1.2.5.4.4	30-JUN-95	28-JUL-95		19	SAND Rpt, Conceptual-Model and Code Evaluations.	Delayed by higher priority work.
549M31	1.2.5.4.9	01-SEP-95	29-SEP-95		19	Memo Report, TSPA Codes Entered into Config Mgmt.	Unavailability of key personnel.
549M41	1.2.5.4.9	01-SEP-95	15-SEP-95		9	Submit Report, Continuum Joint Model & Code.	Unavailability of key personnel.

DELIVERABLES EXPECTED TO COMPLETE NEXT MONTH

EVENT	WBS NUMBER	DUE DATE	EXPECTED DATE	COMPLETED DATE	SLIP	DESCRIPTION	COMMENTS
32221M31	1.2.3.2.2.2.1	14-NOV-94	12-MAY-95		121	Submit TDIF Data Transfer for SD-7, 1000 feet.	SD-7 drilling has been delayed.
32222M71	1.2.3.2.2.2.2	31-MAY-95	31-MAY-95		0	Sand Report Evaluating Prototype Model.	
32623F12	1.2.3.2.6.2.3	01-FEB-95	15-MAY-95		73	Main Drift Cross Section.	SD-7 drilling has been delayed.
32623F14	1.2.3.2.6.2.3	30-NOV-94	15-MAY-95		112	Develop Geologic and Structural Logs for SD-7.	SD-7 drilling has been delayed.
32623F18	1.2.3.2.6.2.3	23-DEC-94	15-MAY-95		95	Develop Rock Quality Estimates for SD-7.	SD-7 drilling has been delayed.
32623F19	1.2.3.2.6.2.3	23-DEC-94	15-MAY-95		95	Develop Rock Mass Mechanical Properties F/sd-7.	SD-7 drilling has been delayed.
0S91	1.2.3.2.7.1.2	15-SEP-94	16-MAY-95		165	Report on Thermal Expansion Data.	Unavailability of key personnel.
0S94	1.2.3.2.7.1.2	30-SEP-94	16-MAY-95		154	Report on Data Analysis for Thermal Properties.	Unavailability of key personnel.
34151M11	1.2.3.4.1.5.1	01-MAY-95	30-MAY-95		20	LEHGC1.1 User's Manual & QA Documentation.	Re-run test case with new code version.

YMP PLANNING AND CONTROL SYSTEM(PACS)
MONTHLY COST/FTE REPORT
Participant: SNL PERIOD: APRIL 95

WBS ELEMENT (3rd)	ACTUAL COSTS	PARTICIPANT** HOURS	SUBCON. HOURS	PURCHASE COMMITMENTS	SUBCON. COMMITMENTS	ACCRUED* COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMULATIVE COSTS
1.2.1	22000	141	96.00	1123.00	9517.22	N/A	282000	222522	205000
1.2.3	823000	3896	1584.00	3000.00	1672555.63	N/A	8923000	7261642	4533000
1.2.4	22000	149	32.00	4891.00	60444.42	N/A	474000	758195	226000
1.2.5	342000	2451	928.00	30328.75	289754.11	N/A	3963000	3597417	2108000
1.2.9	126000	1108	384.00	9794.08	103608.27	N/A	1321000	1129813	720000
1.2.11	86000	166	976.00	2096.00	129203.75	N/A	1000000	840436	429000
1.2.12	40000	177	416.00	6606.00	90439.24	N/A	458000	306254	220000
1.2.15	29000	416	0.00	10295.80	36837.48	N/A	468000	408774	234000
*** Total ***	1490000	8504	4416.00	68134.63	2392360.12		16889000	14525053	8675000

** Participant hours negative due to one-time balance of hours reported with actual SNL Financial System Hours expended

SNL FTEs: 53.6
Contractor FTEs: 27.6

DISCLAIMER:
The Commitment Amounts displayed on this report represent estimates based upon the best available data and should be treated as approximations.

* Note: The SNL Financial system reports Accruals as Actual Costs.

Participant SNL

Prepared - 05/10/95:15:46:47

Yucca Mtn. Site Char. Project-Planning & Control System
PACS Participant Work Station (PPWS)
WBS Status Sheet (WBS02)

01-Apr-95 to 30-Apr-95

Inc. Dollars in Thousands

WBS No. - 1.2

WBS Title - Yucca Mountain Project

Parent WBS No. -

Parent WBS Title -

Element ID - ZZ

Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance

Id	Description	Current Period BCWS	BCWP	ACWP	SV	CV	FY1995 Cumulative to Date BCWS	BCWP	ACWP	SV	CV	FY1995 at Completion BAC	EAC	VAC
1.2.1	Systems Engineering	26	25	22	-1	3	243	221	205	-22	16	282	262	20
1.2.3	Site Investigations	674	720	823	46	-103	6153	4746	4571	-1407	175	8961	8448	513
1.2.4	Repository	35	15	22	-20	-7	336	199	226	-137	-27	474	453	21
1.2.5	Regulatory	321	269	342	-52	-73	2564	1867	2141	-697	-274	3996	4082	-86
1.2.9	Project Management	104	104	126	0	-22	779	779	720	0	59	1321	1303	18
1.2.11	Quality Assurance	83	83	86	0	-3	570	570	429	0	141	1000	715	285
1.2.12	Information Management	36	36	40	0	-4	260	260	220	0	40	458	425	33
1.2.15	Support Services	39	39	29	0	10	267	267	234	0	33	468	444	24
Total		1318	1291	1490	-27	-199	11172	8909	8746	-2263	163	16960	16132	828

Resource Distributions by Element of Cost

Fiscal Year 1995

Budgeted Cost of Work Scheduled

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	9467	9634	9253	9504	11470	11470	8357	7627	8835	6584	8354	5575	106130
LABOR	784	788	773	784	979	955	693	631	731	537	698	461	8814
SUBS	626	661	560	517	772	615	496	472	518	393	466	299	6395
TRAVEL	0	0	0	0	0	0	0	0	0	0	0	0	0
PM&E	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	146	162	143	169	159	190	129	116	137	101	145	83	1680
CAPITAL	0	0	71	0	0	0	0	0	0	0	0	0	71
Total BCWS	1556	1611	1547	1470	1910	1760	1318	1219	1386	1031	1309	843	16960

Actual Cost of Work Performed

LBRHRS	7576	5818	6762	8606	7031	11109	8504	0	0	0	0	0	55406
LABOR	578	615	640	575	611	884	749	0	0	0	0	0	4652
SUBS	138	828	675	276	292	415	276	0	0	0	0	0	2900
TRAVEL	0	0	0	0	0	0	0	0	0	0	0	0	0
PM&E	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	394	-221	46	166	120	153	465	0	0	0	0	0	1123
CAPITAL	0	0	0	0	71	0	0	0	0	0	0	0	71
Total ACWP	1110	1222	1361	1017	1094	1452	1490	0	0	0	0	0	8746

Inc. Dollars in Thousands

WBS No. - 1.2 -Yucca Mountain Project

Resource Distributions

Fiscal Year 1995	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	1556	1611	1547	1470	1910	1760	1318	1219	1386	1031	1309	843	16960
BCWP	1182	1150	1004	1377	1495	1410	1291	0	0	0	0	0	8909
ACWP	1110	1222	1361	1017	1094	1452	1490	0	0	0	0	0	8746
ETC	0	0	0	0	0	0	0	1681	1635	1382	1414	1274	7386

Fiscal Year Distribution

	Prior	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	Future	At Complete
BCWS	0	16960	37610	48603	52478	57225	54211	40357	0	0	0	0	307444
BCWP	0	8909	0	0	0	0	0	0	0	0	0	0	
ACWP	0	8746	0	0	0	0	0	0	0	0	0	0	
ETC	0	7386	38000	48603	52478	57225	54211	40357	0	0	0	0	307006

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: NESBIT** **WBS: 1.2.3.1.2**

WBS TITLE: PARTICIPANT MANAGEMENT AND INTEGRATION

P&S ACCOUNT: 0S312

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
348	348	250	0	0.0	100.0	98	28.2	139.2	575	512	63	11.0	413	86.6

Analysis

Cumulative Cost Variance:

This P&S Account will underrun primarily because SNL site support services provided by REECo were budgeted both by SNL and REECo. Because the actual costs will be collected against REECo, this P&S Account will underrun in FY95. Other factors contributing to this forecast underrun are lower than planned Technical Program Review (TPR) costs and no support required for SNL study plans so far this fiscal year.

The Estimate at Completion (EAC) of 0S312 has been reduced in FY95. No milestones are impacted.

This variance is unrecoverable since SNL can complete the statement of work without spending as much as anticipated. However, some of the underrun will be recovered due to unbudgeted costs associated with providing additional SNL support in Las Vegas.

Variance at Completion:

See the cumulative cost variance above.

Peter R. Dam 5-10-95
P&S ACCOUNT MANAGER **DATE**

James A. Blaylock 5/11/95
TPO **DATE**

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: TYNAN** **WBS: 1.2.3.2.2.2.1**

WBS TITLE: SYSTEMATIC ACQUISITION OF SITE-SPECIFIC SUBSURFACE INFO.

P&S ACCOUNT: 0S32221

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
385	254	211	-131	-34.0	66.0	43	16.9	120.4	421	379	42	10.0	350	99.4

Analysis

Cumulative Schedule Variance:

This effort is behind schedule due to changes in the drilling schedule. The drilling of SD-12, which was supposed to resume in September 1994, will not resume until May 1995, due to, among other reasons, delay in receipt of replacement dual-wall drill pipe. Therefore, much of the effort to support SD-12 has been delayed until later in FY95 than planned and even partially into FY96. Completion of SD-7 (Phase I) has been delayed from December 1994 to March 1995, due primarily to delaying the start of SD-7 into FY95 and to the decision to divert SD-7's crew to higher priority efforts. Also, perched water was encountered in SD-7, necessitating extended hydrologic testing by USGS.

As a result, all SNL Level 3 Milestones relating to SD-7 and SD-12 have been delayed (32221M12, M13, M14, 32221M31, M32, M33, M34, 32621M12, 32623F12, F14, F18, and F19). It is not known what impact there is to YMSCO Level 0-2 Milestones.

This variance will be partially recovered in FY95, provided there are no further delays in the drilling of SD-7 or the resumption of SD-12.

Peter B. Dunn 5-10-95
P&S ACCOUNT MANAGER DATE

TPO 5/11/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: TYNAN** **WBS: 1.2.3.2.2.2.2**

WBS TITLE: THREE-DIMENSIONAL ROCK CHARACTERISTICS MODELS

P&S ACCOUNT: 0S32222

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
426	256	324	-170	-39.9	60.1	-68	-26.6	79.0	689	656	33	4.8	872	130.4

Analysis

Cumulative Schedule Variance:

This effort is behind schedule because resources which had been planned for were not available to start this effort as baselined.

All SNL Level 3 Milestones will be completed as scheduled.

Previously unavailable resources are now available to complete this effort. Also, additional resources have been added to make up for lost time and completely recover this variance prior to the end of FY95.

Peter B. Dorn 5-10-95
P&S ACCOUNT MANAGER DATE

TPO 5/11/95
DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SULLIVAN** **WBS: 1.2.3.2.6.2.3**

WBS TITLE: SURFACE FACIL. FIELD TESTS & CHAR. MEAS.

P&S ACCOUNT: 0S32623

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
332	226	242	-106	-31.9	68.1	-16	-7.1	93.4	332	332	0	0.0	357	117.8

Analysis

Cumulative Schedule Variance:

This variance is due to the delay in drilling SD-7. Drilling was suspended on October 11, 1994 at 51 feet and the drilling crew was reassigned to a more time-critical project. Drilling was not resumed until November 8, 1994. In addition, because drilling did not begin in FY94 as scheduled for FY95 planning, the REECo completion date for SD-7 (Phase I) has been pushed from December 4, 1994 to May/June 1995.

As a result, all SNL Level 3 Milestones relating to SD-7 have been delayed (32623F12, F14, F18, F19, 32221M31, M32, M33, and M34). It is not known what impact there is to YMSCO Level 0-2 Milestones.

This variance will be fully recovered in May 1995, provided there are no further delays in the drilling of SD-7.

David E. Haught for David S. Hessel 5/10/95
P&S ACCOUNT MANAGER DATE

TPO 5/11/95
DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: BOYLE** **WBS: 1.2.3.2.7.3.2**

WBS TITLE: IN-SITU THERMOMECHANICAL PROPERTIES

P&S ACCOUNT: 0S32732

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
260	208	365	-52	-20.0	80.0	-157	-75.5	57.0	459	526	-67	-14.6	805	155.9

Analysis

Cumulative Cost Variance:

This effort is overrunning because much of work is related to the consolidated thermal test plan and is out of scope.

Effort being devoted to the consolidated thermal test plan will cause this WBS to overrun by approximately $67,000 in FY95. In addition, the following SNL Level 3 Milestones will be delayed (approved by R. M. Nelson):

42111M11 Progress Rpt, NR Access Convergence Test Design
42112M11 Submittal of Final In Situ Thermomech Props SP
42112M12 Submittal of Draft In Situ Thermomech Props SP
4232M11 SLTR, SBD Development Strategy & Planning Doc

It is not known what impact there is to YMSCO Level 0-2 Milestones.

This overrun is being minimized by the approved diversion of planned activities into FY96. However, as stated above, $67,000 cannot be recovered in FY95.

Variance At Completion:

See the cumulative cost variance above.

David F. Hanley for John Pott 5/11/95
P&S ACCOUNT MANAGER DATE

TPO 5/11/95
DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: BOYLE** **WBS: 1.2.3.2.7.3.4**

WBS TITLE: IN-SITU DESIGN VERIFICATION

P&S ACCOUNT: 0S32734

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
885	859	990	-26	-2.9	97.1	-131	-15.3	86.8	1566	1701	-135	-8.6	1804	99.4

Analysis

Cumulative Cost Variance:

This effort is overrunning because the density of instrumentation on steel sets for monitoring has been much greater than planned.

No SNL Level 3 Milestones are impacted. It is not known what impact there is to YMSCO Level 0-2 Milestones. The Estimate at Completion has been increased by $135,000.

To date, no corrective action has been developed.

Variance At Completion:

See the cumulative cost variance above.

for John Pott 5/15/95
P&S ACCOUNT MANAGER **DATE**

TPO 5/15/95 **DATE**
for LSC

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: PATTERSON** **WBS: 1.2.3.6.2.1.6**

WBS TITLE: FUTURE REGIONAL CLIMATE AND ENVIRONMENTS

P&S ACCOUNT: 0S36216

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
417	179	251	-238	-57.1	42.9	-72	-70.2	71.3	630	569	61	9.7	884	141.8

Analysis

Cumulative Schedule Variance:

This variance exists because a regional climate model (RegCM2) simulation that was completed in FY94 must be conducted again in FY95 due to a problem with the sea surface temperature (SST) data set. The data file convention was different than the one that was previously used. This problem was not identified until after FY95 planning was completed, so the consequent delays could not be incorporated.

In order to build confidence for the model prior to nesting it within the GENESIS global climate model, the simulation must be run again before proceeding with the other climate model validation tasks in 0S36216. Consequently, all the climate validation activities will be delayed approximately 3 months. All SNL milestones/activities will be completed in FY95, with the exception of SNL Level 3 Milestone 36216M11, "Climate Model Validation SAND Report." This report will not be completed until the first quarter of FY96. It is not known what effect there is on any YMSCO Level 2 Milestones. The Estimate at Completion (EAC) will not increase for FY95, but additional funding will be needed to complete the scope of work that will be pushed into FY96.

This variance is not fully recoverable in FY95 because the simulation must be run again to validate the climate model, and no other efforts can begin until the simulation is complete. The application of additional resources cannot recover the schedule, so completion of this effort must be pushed to FY96.

P&S ACCOUNT: 0S36216

Analysis (cont.)

Variance at Completion

This effort will underrun in FY95 because much of the effort planned cannot be completed until FY96. See the cumulative schedule variance above.

The Estimate at Completion has been decreased in FY95 and increased in FY96.

This variance cannot be recovered in FY95 because of the duration required to complete the testing.

for Hugh Church 5/11/95
P&S ACCOUNT MANAGER DATE

5/11/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: TYNAN** **WBS: 1.2.3.11.2**

WBS TITLE: SURFACE-BASED GEOPHYSICAL TESTING

P&S ACCOUNT: 0S3B2

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
120	0	0	-120	-100.0	0.0	0	100.0	0.0	210	66	144	68.6	0.0	318.2

Analysis

Cumulative Schedule Variance:

This effort is behind schedule because it has been deferred pending the placing of a service contract by the CRWS M&O contractor for the physical logging activities. Currently, borehole video logs are not anticipated to be available for interpretation prior to the second quarter of calendar year 1995.

The Estimate at Completion (EAC) for 0S3B2 has been reduced in FY95 to reflect the lower level of support, and increased in FY96.

No SNL Level 3 Milestones related to this activity will be delayed because they are all progress reports and will by submitted listing little or no activity. It is not known how these changes will impact YMSCO Level 2 Milestones.

This variance cannot be recovered in FY95 unless the service contract is put in place and a work-around is developed to make up for the lost time.

Variance at Completion:

This effort will underrun in FY95 because it has been deferred pending the placing of a service contract by the CRWS M&O contractor for the physical logging activities. Currently, borehole video logs are not anticipated to be available for interpretation prior to the second quarter of calendar year 1995.

The Estimate at Completion (EAC) for 0S3B2 has been reduced in FY95 to reflect the lower level of support, and increased in FY96.

P&S ACCOUNT: 0S3B2

Analysis (cont.)

No SNL Level 3 Milestones related to this activity will be delayed because they are all progress reports and will by submitted listing little or no activity. It is not known how these changes will impact YMSCO Level 2 Milestones.

This variance cannot be recovered in FY95 unless the service contract is put in place and a work-around is developed to make up for the lost time.

Peter B. Dam 5-10-95 Lauren A. Hoffman 5/11/95

P&S ACCOUNT MANAGER **DATE** **TPO** **DATE**

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: BOYLE** **WBS: 1.2.3.13.1**

WBS TITLE: SEALS PERFORMANCE REQUIREMENTS

P&S ACCOUNT: 0S3D1

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
132	65	22	-67	-50.8	49.2	43	66.2	295.5	151	63	88	58.3	51	209.8

Analysis

Variance at Completion:

The "Development of Preliminary Designs for North Ramp Seals" effort has been delayed due to forecasted delays in completion of North Ramp construction. As a result, the level of support required in FY95 will be lower than planned. Also, diversion of key staff to support the consolidated thermal test plan as well as to perform unanticipated management duties has prevented progress and charges against this effort.

The Estimate at Completion (EAC) for 0S3D1 has been reduced in FY95 to reflect the lower level of support. However, it has not yet been increased in FY96 because of uncertainties regarding the construction program.

Because of the delay, SNL Level 3 Milestone 461M21, "North Ramp Seal Conceptual Design," will not be completed in FY95. It is not known how these changes will impact YMSCO Level 0-2 Milestones.

This variance cannot be recovered in FY95 unless the construction program is recovers its schedule and work-arounds are developed to make up for lost time.

David G. Hanger for Ray Finley 5/11/95
P&S ACCOUNT MANAGER DATE

TPO 5/11/95
DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: BOYLE** **WBS: 1.2.3.13.2**

WBS TITLE: SEALING TESTING

P&S ACCOUNT: 0S3D2

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
452	364	155	-88	-19.5	80.5	209	57.4	234.8	601	360	241	40.1	256	115.6

Analysis

Cumulative Cost Variance:

Diversion of key staff to support the consolidated thermal test plan as well as to perform unanticipated management duties has prevented progress and charges against this effort. Certain efforts which had been planned in order to complete the scope of work will not be required. Because of this, the scope of work will be completed at a lower than anticipated cost.

The Estimate at Completion (EAC) for 0S3D2 has been reduced in FY95 and increased in FY96. There is currently no impact to any milestones.

Additional resources are being applied to this effort so that all milestones will be completed as scheduled.

Variance at Completion:

See the Cumulative Cost Variance above.

for Ray Finley 5/11/95
P&S ACCOUNT MANAGER DATE

5/11/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: STUCKER** **WBS: 1.2.4.5**

WBS TITLE: SCIENTIFIC/DESIGN INTERFACE FOR ACD

P&S ACCOUNT: 0S45

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
244	107	136	-137	-56.1	43.9	-29	-27.1	78.7	314	296	18	5.7	399	129.4

Analysis

Cumulative Schedule Variance:

This effort is behind schedule because resources which were initially assigned have been diverted to support the consolidated thermal test plan.

SNL Level 3 Milestone 4232M11, "Scientific Basis for Design Development Strategy and Planning Document," has been delayed to the end of FY95. It is not known what impact this delay has to any YMSCO Level 0-2 Milestones.

This variance will be fully recovered in FY95 because additional resources will be applied between now and the end of the fiscal year.

P&S ACCOUNT MANAGER 5-11-95 DATE

TPO 5/11/95 DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: GIL** **WBS: 1.2.5.1.1**

WBS TITLE: REGULATORY COORDINATION AND PLANNING

P&S ACCOUNT: 0S511

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
221	221	259	0	0.0	100.0	-38	-17.2	85.3	388	473	-85	-21.9	455	78.0

Analysis

Variance At Completion:

For the efforts planned to be completed within this WBS during FY95, the budget received for FY95 was insufficient.

The Estimate at Completion (EAC) for 0S511 has been increased. No milestones are impacted.

This variance is unrecoverable in FY95 because the planned efforts are considered minimal and not discretionary.

P&S ACCOUNT MANAGER 5/11/95 DATE TPO 5/11/95 DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SMISTAD** **WBS: 1.2.5.4.1**

WBS TITLE: TOTAL SYSTEM PERFORMANCE ASSESSMENT

P&S ACCOUNT: 0S541

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
809	353	410	-456	-56.4	43.6	-57	-16.1	86.1	1137	975	162	14.2	1321	138.8

Analysis

Cumulative Schedule Variance:

This effort is behind schedule because labor resources that were planned to be committed to this effort have been required to support the "Performance Assessment for Calico Hills Characterization Strategy" (Summary Account 0S15S30). Other resource issues such as illness have contributed to this variance.

Because of this variance, SNL Level 3 Milestones 541M11, "Initial TSPA Subsystem Modeling," 541M51, "Modeling Results for TSS Documentation," and 541N11, "Submit all Site Characterization Memoranda," will be delayed 4-6 months. Also, SNL Level 3 Milestone 541M81, "Mechanical Influence on Coupling," will be delayed 3 months into FY96. It is not known what effect if any this variance has on any YMSCO Level 0-2 Milestones.

Because the effort within 0S541 has been replanned internally and additional resources have been acquired, this variance will be completely recovered by the end of FY95, except for 541M81 and supporting activities (will not be done at all in FY95).

Variance at Completion:

This effort will underrun in FY95 primarily because resources which were planned to be used were diverted (see above) to efforts of higher priority. The underrun will be mainly incurred in support of 541M81.

The Estimate at Completion (EAC) has been reduced for FY95.

Because additional resources are not available, this variance will not be fully recovered in FY96. However, the acquisition of additional resources should reduce magnitude of the underrun.

P&S ACCOUNT: 0S541 (cont.)

P&S ACCOUNT MANAGER 5/11/95 DATE

TPO 5/11/95 DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SMISTAD** **WBS: 1.2.5.4.4**

WBS TITLE: SITE PERFORMANCE ASSESSMENT

P&S ACCOUNT: 0S544

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
607	549	688	-58	-9.6	90.4	-139	-25.3	79.8	990	1167	-177	-17.9	1241	92.1

Analysis

Cumulative Cost Variance:

The effort to complete SNL Level 3 Milestone 544M11, "FY94 GWTT Calculations," was much greater than anticipated, due in part to the addition of new personnel to complete the report. Consequently, this effort will overrun.

No milestones are impacted, but the Estimate at Completion has been increased by $177,000.

Workarounds are being investigated to determine if the remaining work can be completed with less resources than planned.

Variance at Completion:

See the cumulative cost variance above.

Dan E. Hamstra for R. W. Barnard 5/15/95
P&S ACCOUNT MANAGER DATE

TPO for LSC 5/15/95
TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SMISTAD** **WBS: 1.2.5.4.9**

WBS TITLE: DEVELOP. & VERIFICATION OF FLOW AND TRANSPORT CODES

P&S ACCOUNT: 0S549

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
238	63	77	-175	-73.5	26.5	-14	-22.2	81.8	315	184	131	41.6	385	235.5

Analysis

Cumulative Schedule Variance:

This effort is behind schedule because the individual who had been budgeted is no longer available to SNL.

There is no impact currently forecasted to any SNL Level 3 or YMSCO Level 0-2 Milestones. However, this effort will underrun in FY95.

A new person has been made available and anticipates being able to recover the schedule prior to the end of FY95.

Variance at Completion:

This effort will underrun in FY95 because George Perkins and Eric Smistad have agreed not to perform the benchmark calculation of the heated-block test in FY95, as was previously planned.

All milestones will still be completed in FY95, and the Estimate at Completion has been decreased by $87,000.

A C/SCR & AFP may be processed to return the scope, budget, and funding to YMSCO, for that part of the effort which will not be completed in FY95. If processed, this variance will be reduced below the variance analysis threshold.

P&S ACCOUNT MANAGER 5/11/95 DATE TPO 5/11/95 DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SPENCE** **WBS: 1.2.11.3.1**

WBS TITLE: QUALITY ASSURANCE PROGRAM DEVELOPMENT

P&S ACCOUNT: 0SB31

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
165	165	112	0	0.0	100.0	53	32.1	147.3	290	155	135	46.6	197	290.7

Analysis

Variance at Completion:

This effort will underrun in FY95 because it is being performed by the DOE after 7/1/95.

The Estimate at Completion (EAC) for 0SB31 has been reduced in FY95.

This variance will be recovered in FY95 following preparation, approval, and implementation of a C/SCR to remove the scope of work and budget.

P&S ACCOUNT MANAGER 5/11/95 DATE

TPO 5/11/95 DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SPENCE** **WBS: 1.2.11.3.2**

WBS TITLE: QUALITY ASSURANCE VERIFICATION - SURVEILLANCE

P&S ACCOUNT: 0SB32

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
76	76	34	0	0.0	100.0	42	55.3	223.5	132	70	62	47.0	59	155.6

Analysis

Variance at Completion:

This effort will underrun in FY95 because the resources originally committed during the planning process were not available to do the work.

The Estimate at Completion (EAC) for 0SB32 has been reduced in FY95.

This variance will be not be recovered in FY95 because sufficient resources are not available.

P&S ACCOUNT MANAGER — DATE 5/11/95

TPO — DATE 5/11/95

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Through: APRIL 1995

PARTICIPANT: SNL **PEM: SPENCE** **WBS: 1.2.11.5**

WBS TITLE: QUALITY ASSURANCE - QUALITY ENGINEERING

P&S ACCOUNT: 0SB5

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	%	SPI	CV	%	CPI	BAC	EAC	VAC	%	IEAC	TCPI
137	137	109	0	0.0	100.0	28	20.4	125.7	240	141	99	41.3	191	321.9

Analysis

Variance at Completion:

This effort will underrun in FY95 because the resources originally committed during the planning process were not available to do the work.

The Estimate at Completion (EAC) for 0SB5 has been reduced in FY95.

This variance will be not be recovered in FY95 because sufficient resources are not available.

P&S ACCOUNT MANAGER — DATE 5/11/95

TPO — DATE 5/11/95

SF 1050-A (6-92)

TEMPORARY DELEGATION OF AUTHORITY

Temporary delegations of authority are delegations by an absent Director or above to a Manager in direct line authority within the absent principal's organization.

TO: Distribution:

Temporary approval authority for

Name: Laurence S. Costin Level: Acting: Technical Project Officer Org. 6302

is delegated to the individual(s) listed below for the stated dates.

Approval authority is delegated to:	Organization	EFFECTIVE DATES From date	Through date
Sarah Sharpton	6352	5/1/95	5/3/95
Ray Finley, Acting	6313	5/16/95	5/18/95
Richard Thompson	6351	5/12/95	5/12/95
HollyDockery	6312	5/15/95	5/15/95

Approved by Delegating Manager

4/27/95
Date

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153 Capital Accounting Services
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- Both "From" and "Through" dates must be completed.
- The original form is to be filed in the Originating Organization.
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- Related SLI: SLI 1050

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Box 25046 M.S. 425
Denver Federal Center
Denver, Colorado 80225

IN REPLY REFER TO:

I-370702

INFORMATION ONLY

May 15, 1995

Vince Iorii
Yucca Mountain Site Characterization
  Project Office
U. S. Department of Energy
P.O. Box 98608
Las Vegas, Nevada 89193-8608

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS) Progress Report, April 1995

Dear Vince:

Attached is the USGS progress report in the required format for the month of April, 1995.

It should be noted that **variance at completion numbers are based on PACS budgets and do not necessarily indicate available funds.** A number of Approved Funding Program changes (AFP) have been made which do not involve a change in scope of work and therefore do not require a Cost/Schedule Change Request. Reductions in USGS funding must be made based on available funds in the AFP, not the PACS budget.

If you have any questions or need further information, please call me or Raye Ritchey at (303)236-0516, ext. 282.

Sincerely,

Raye E. Ritchey
for Larry R. Hayes
Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

Enclosure:
cc: R. Dyer, DOE/Las Vegas
[illegible] DOE/Las Vegas
S. Jones, DOE/Las Vegas
W. Kozai, DOE/Las Vegas
R. Patterson, DOE/Las Vegas
A. Simmons, DOE/Las Vegas
R. Spence, DOE/Las Vegas
T. Sullivan, DOE/Las Vegas
M. Tynan, DOE/Las Vegas
D. Williams, DOE/Las Vegas
C. Glenn, NRC/Las Vegas (2 copies)
P. Burke, M&O/Las Vegas
M. Lawson, LANL/Las Vegas
J. Schelling, SNL/Las Vegas
R. St. Clair, M&O/Las Vegas
G. Bodvarsson, LBL/Berkeley
M. Chornak, USGS/Denver
R. Craig, USGS/Las Vegas
L. Ducret, USGS/Denver
D. Gillies, USGS/Denver
R. Luckey, USGS/Denver

Iorii
See CC list (10)
w/o: Cook, Graun, Dixon, Adams, Bracoun

REC'D YMP 5/22/95

ENCLOSURE 9

YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey
Date Prepared 05/10/95 14:53

MONTHLY COST/FTE REPORT

Fical Month/Year APRIL 1995

	CURRENT MONTH END						FISCAL YEAR		
WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.2.1	14	64	0	0	0	0	134	100	28
1.2.3	2052	21086	14014	219	3134	0	27085	19730	12414
1.2.5	42	696	1028	0	145	0	1286	997	441
1.2.9	74	880	544	0	170	0	1091	1092	569
1.2.11	149	1120	2127	0	609	0	1900	1429	976
1.2.12	30	0	823	0	257	0	530	282	221
1.2.13	7	248	0	225	0	0	1079	815	293
1.2.15	186	1264	1124	0	288	0	2180	1641	1347
TOTALS	2554	25358	19660	444	4603	0	35285	26086	16289

Inc. Dollars in Thousands

Yucca Mtn. Site Char. Project-Planning & Control System
PACS Participant Work Station (PPWS)
WBS Status Sheet (WBS02)

WBS No. - 1.2

WBS Title - Yucca Mountain Project

Parent WBS No. -

Parent WBS Title -

Element ID - ZZ

Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance

		Current Period					FY1995 Cumulative to Date					FY1995 at Completion		
Id	Description	BCWS	BCWP	ACWP	SV	CV	BCWS	BCWP	ACWP	SV	CV	BAC	EAC	VAC
1.2.1	Systems Engineering	11	11	14	0	-3	76	76	29	0	47	134	80	54
1.2.3	Site Investigations	2167	2167	2069	0	98	15539	14884	12527	-655	2357	27085	26062	1023
1.2.5	Regulatory	100	100	42	0	58	737	737	443	0	294	1286	1164	122
1.2.9	Project Management	85	85	73	0	12	511	511	567	0	-56	1091	1160	-69
1.2.11	Quality Assurance	154	154	150	0	4	1109	1109	982	0	127	1900	1827	73
1.2.12	Information Management	44	44	29	0	15	308	308	222	0	86	530	500	30
1.2.13	Environment, Safety, and H	90	89	9	-1	80	537	540	276	3	264	1079	1083	-4
1.2.15	Support Services	183	183	187	0	-4	1274	1274	1351	0	-77	2180	2313	-133
Total		2834	2833	2573	-1	260	20091	19439	16397	-652	3042	35285	34189	1096

Resource Distributions by Element of Cost

Fiscal Year 1995
Budgeted Cost of Work Scheduled

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	30647	31318	27115	29698	32380	33220	32993	33217	31523	31125	30517	30552	374305
LABOR	1205	1204	1029	1191	1304	1347	1328	1365	1301	1285	1269	1275	15103
SUBS	875	896	892	878	915	936	911	959	939	961	905	969	11036
TRAVEL	130	147	112	135	130	144	132	133	116	112	94	87	1472
PM&E	194	188	219	353	128	269	125	151	147	151	82	67	2074
OTHER	323	279	283	631	516	353	328	461	300	326	315	577	4692
CAPITAL	0	0	0	0	39	12	10	80	542	0	0	225	908
Total BCWS	2727	2714	2535	3188	3032	3061	2834	3149	3345	2835	2665	3200	35285

Inc. Dollars in Thousands

WBS No. - 1.2 -Yucca Mountain Project

Resource Distributions by Element of Cost

Fiscal Year 1995
Actual Cost of Work Performed

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	18146	19477	17987	27965	24888	29359	23962	0	0	0	0	0	161784
LABOR	679	676	787	1397	1107	1279	1046	0	0	0	0	0	6971
SUBS	783	845	760	562	811	1028	715	0	0	0	0	0	5504
TRAVEL	22	68	61	58	87	62	153	0	0	0	0	0	511
PM&E	135	234	227	-81	223	327	403	0	0	0	0	0	1468
OTHER	143	170	263	337	493	230	235	0	0	0	0	0	1871
CAPITAL	0	0	0	0	39	12	21	0	0	0	0	0	72
Total ACWP	1762	1993	2098	2273	2760	2938	2573	0	0	0	0	0	16397

Resource Distributions

Fiscal Year 1995	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	2727	2714	2535	3188	3032	3061	2834	3149	3345	2835	2665	3200	35285
BCWP	2451	2569	2633	3449	2836	2668	2833	0	0	0	0	0	19439
ACWP	1762	1993	2098	2273	2760	2938	2573	0	0	0	0	0	16397
ETC	0	0	0	0	0	0	0	3095	3820	3671	3619	3587	17792

Fiscal Year Distribution

	Prior	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	Future	At Complete
BCWS	0	35285	13487	416	0	0	0	0	0	0	0	0	49188
BCWP	0	19439	0	0	0	0	0	0	0	0	0	0	
ACWP	0	16397	0	0	0	0	0	0	0	0	0	0	
ETC	0	17792	13488	416	0	0	0	0	0	0	0	0	48093

U.S. Geological Survey
EXECUTIVE SUMMARY
April 1995

WBS 1.2.3.1 - Coordination and Planning

United States Geological Survey-Yucca Mountain Project Branch (USGS-YMPB) is currently processing 209 scientific publications: 87 hydrologic-related reports and 100 geologic-related reports, 31 YMP-LBL scientific publications, and 83 abstracts.

WBS 1.2.3.2 - Geology

As part of rock characteristics studies, vertical and lateral distribution of stratigraphic units within the site area, work on the 3-D site-scale model continued. A draft map of intersections based upon the vitric-zeolitic (v-z) elevation map was completed and a 3-D surface of this map was constructed within Lynx. The isochore map (based upon estimated distance from Tptpv3, Surface 9) was converted to elevation space in Lynx. The v-z surface for each block was merged, allowing a preliminary assessment of the v-z model. Cross-sections of this boundary also have been produced depicting its spatial relation with selected units to aid in preliminary evaluations. To date, all blocks have been converted into 3-D surfaces. Preliminary pre-processing of the Paleozoic elevation map was made to evaluate the surface. The point set was contoured at a contour interval of 500 m. This basement elevation map was derived by subtracting the depth to basement map from an averaged (15 x 15 sec) 1:250,000 DEM topography surface. A 2-D plot of the Paleozoic surface at 1:100,000 scale was constructed for comparison to a similar plot; 3-D plots of the basement and water table were constructed to visually compare the spatial relationship of the two surfaces.

In lithologic logging of core studies, core from borehole UZ-7A from depths between 35 and 450 ft were examined; identification of lithologic contacts were begun. Plots of hydrologic properties for the lithostratigraphic units were completed for seven of the UZ-N boreholes.

Studies to determine lithologic and hydrologic properties in the PTn continued with examination of hydrologic and geophysical properties of units Tpbt2, Tpbt3, Tpp, Tpy, and Tpcpv in light of stratigraphic picks from recently acquired geophysical data from USW UZ-14 and UE-25 NRG#4. Three stratigraphic sections were measured and described along Solitario Canyon cliff below and just north of borehole USW UZ-6s. This concludes the planned measured-section work along Solitario Canyon where nine stratigraphic sections that include the three fracture pavements, and five hydrologic-property traverses have been measured. Additionally, a stratigraphic section through the PTn unit (PTn #10) that is located on the east side of Abandoned Wash was measured. An examination of the Pah Canyon Tuff in boreholes USW UZ-N31 and N32, G-2, and G-4 and UE-25 NRG #2B, a#1, a#4, a#5, a#6, a#7, and NRG #4, indicated Tpp varies downward from vitric to zeolitic; fractures occur in the underlying Tpbt2 interval. The crystal-poor vitric zone of the Tiva Canyon Tuff in boreholes USW UZ-N11, N31, N32, N53, N54, NRG-7/7A, SD-9, SD-12, NRG-6, GU-3, G-4, and UE-25 UZ#16, a#1, a#4, and a#6 were examined and checked for consistency in the pv1/pv2 contact and for evidence of a flow-unit boundary that occurs in exposures along Solitario Canyon.

As part of structural features studies within the Site area, work to enhance surface geologic maps continued with the examination of exposures of the lower part of the Tiva Canyon Tuff in Solitario Canyon; strike, dip, and separation data on faults and foliation orientation of pumice clasts in the lower few meters of the columnar subzone of the Tiva Canyon Tuff were collected. Geologic mapping in the Little Prow area to determine the projected intersection of the Sundance fault system with the Solitario Canyon fault indicated that there is no demonstrable offset of the Solitario Canyon fault by the Sundance fault system. However, mapping to the southeast along the Sundance fault system has confirmed the presence of numerous discrete, albeit discontinuous, northwest-trending faults within the Sundance fault system.

Geologic mapping in the Exploratory Studies Facility (ESF) continued with analysis of field data collected from between stations 0+60 and 4+00. Geologic mapping of the North Ramp tunnel continued during advance of the TBM. Full peripheral mapping was completed to about station 5+00 (meters); detailed line surveys were completed to station 5+40; photogrammetry work and sample locations was completed to station 5+23, and 69 samples were collected during the reporting period under the consolidated sampling program. The face of the tunnel was 621.21 m (2,038.1 ft) from the North Portal as of April 28, 1995.

Geologic, geophysical, and seismic data continue to be collected to support seismic source evaluation and characterization for the Probabilistic Seismic Hazard Analysis. An important new dataset of data previously analyzed was acquired during the data-needs workshop, and the existence of a new dataset of strong-motion data from the Little Skull Mountain earthquake was uncovered; most of the new data will be processed by an outside vendor.

Current seismicity data were recorded by the CalTech-USGS Seismic Processor (CUSP) for all sites in April; there was a 25-minute downtime for the recording system. All southern Great Basin seismic events have been picked and checked through April 30, 1995. The 80-channel computer-backup system for the Southern Great Basin Seismic Network (SGBSN) was fully operational for all of April.

Studies to determine faulting in NE-trending fault zones continued; logging is now about 85 percent complete. Field trench logs continue to be digitized and edited.

As part of studies to determine Quaternary faulting within the site area, logging of trenches on Crater Flat fault is in progress; supportive trench logs and data continue to be compiled and revised. Trench logs for Windy Wash fault are being prepared for field review; field review of logs from trench CF1 on Fatigue Wash fault is complete. For the Ghost Dance fault and northwest-trending faults, preliminary field trench logs for trenches GDF-T2, T3, and T4 were completed; compilation of field logs for trench GDF-T1 is in progress. Field logs were completed for the north wall and inner slot of Trench A1 on the Paintbrush Canyon fault; preparation of a preliminary log for the entire trench is now complete.

Geodetic leveling field work was completed by April 21; two days were lost due to high winds or rain. For the month of April, 38 km of leveling (19 percent of 200 km total) were completed. To date, all 200 km of leveling have been completed.

WBS 1.2.3.3 - Hydrology

Collection of synoptic weather data continued in the form of weather charts and weather satellite images. Lightening data also are being collected during storms. Weather stations in the network continue to collect wind, temperature, relative humidity, solar radiation, and barometric pressure data. Analysis of daily precipi-

tation totals for all tipping-bucket rain gage sites during the 1994-95 winter season was continued. The storage-gage network was read and the data compiled following each storm during April.

Records for Water Year 1994 for 17 continuously-recording streamflow gages, 11 crest-stage gages, two miscellaneous streamflow sites, and 29 precipitation gages have been computed, checked, and reviewed; all records have been forwarded to the Nevada District for table-formatting, camera-ready review, and inclusion into the Nevada District annual Water Resources Data Report. Field surveys were completed for the March 11, 1995 peak flows at streamflow gaging stations in the upper Fortymile Wash Canyon area near Buckboard Mesa. High water marks for the peak flows experienced during the March 11 storms, flagged in March, were surveyed; step-backwater analysis of the data will give indirect estimates of the flows.

As part of recharge studies in Fortymile Wash, depth-to-water measurements were obtained in UE-29 UZN#91, a#1, and a#2 to monitor changes in water levels from hydrologic conditions, especially from the March 11 runoff event in Fortymile wash, the largest in at least the past 10 years. Boreholes UE-29 UZN#91 and #92 were logged with a neutron tool to monitor moisture content in the unsaturated zone; precipitation gages at both sites were read. Photographs of the March 1995 rainfall/runoff event were labeled, and scanned images were installed on the computer.

Calibration continued of the regional saturated-zone numerical flow model, and modifications were continuously made to various packages to improve the conceptual model; for example, zone maps were developed for hydraulic conductivity values in the BCF package. A parameter-estimation package component for spring discharge rates was developed; development of the parameter-estimation package component for head observations continued. Conversion of the MODFLOW model to a MODFLOWP format continued; conversion will be completed by the end of May. Work continued on calibration of the regional 3-D flow model, which will be used for the initial estimates of the site boundary conditions.

In unsaturated zone hydrology studies to determine infiltration properties, boreholes USW UZ-N53, N54, N55, and N27 were logged using four orientations of the gamma-gamma probe and the neutron-neutron probe. These holes are used for continual refinement of the different calibration curves. A controlled experiment to determine the effects of air-gap spacing on the gamma-gamma tool counts was preformed. Blocks of known density were used in conjunction with a section of drillhole casing. The casing was raised to various heights above the blocks, and counts were collected. These measurements will be compared to measurements of known density obtained in the field and quantified. Results of the experiment will determine the influence of air gaps on gamma-gamma counts and indicate necessary corrections. In other work, rock-fragment contents were determined for the 465 surface grab samples; results are being used to correct for the percent water content held by the less than 2 mm size fraction. Along Fran Ridge, four double-ring infiltration tests were performed. Bulk samples were collected from each site and are being used as part of the characterization of surficial materials for the preliminary properties maps.

The monthly logging of neutron-access boreholes in support of unsaturated zone (UZ) infiltration studies was completed for April. Due to heavy precipitation and runoff in washes during March, boreholes in Pagany, Wren, Split, and Coyote washes were logged at intervals of one to two weeks in an effort to obtain critical data for recording and understanding episodic pulses of infiltration following runoff events, for recording and understanding fracture flow in the near surface resulting from saturated conditions in surficial materials, and for developing and calibrating watershed models for predicting spatially and temporally variable net-infiltration rates. In development of the conceptual model, work continued on the statistical and graphical analysis of relative water-content changes for selected neutron-access boreholes in Split Wash for the complete period of record (1984 through April 1995) were calculated and graphed, and statistical analysis of profiles for UE-

25 UZN #97 and UZN #28 was completed. Results were used to initiate the development and calibration of a simplified, universal ET function. Analysis of moisture redistribution following the runoff in March continued.

In infiltration distribution studies, characterization of fracture/fault properties, 10 one-inch-diameter core samples were measured for collected fracture/fault-fill material. Four cores parallel to the layering and cores perpendicular to the layering were obtained from the West Fault samples and two cores were taken from the Whale Back Ridge Pavement samples. For the West Fault samples, the cores parallel to the layering had an average saturated hydraulic conductivity of $1.71\ 10^{-6}$ m/s, and the cores perpendicular to the layering and an average saturated hydraulic conductivity of $1.05\ 10^{-11}$ m/s. The Whale Back Ridge samples had an average saturated hydraulic conductivity of $2.58\ 10^{-8}$ m/s. In studies to develop a net infiltration map, the lithologic units identified in the Scott and Bonk map (1984) were classified into the 27 hydrogeologic units currently being used and into 16 preliminary units that will be used in the net infiltration map.

In surface-based studies of percolation in the unsaturated zone, determination of matrix hydrologic properties continued with completion and submittal of data packages for core properties from USW UZ-14 and SD-9, SD-12, and three radial boreholes, helium pycnometry for particle density on all USW UZ-16 samples, and air permeabilities on 12 radial borehole samples plus 12 zones in USW UZ-16. Core from borehole USW SD-7 has been processed through about 1,100 ft (335 m); processing is completed for core from borehole USW NRG-6. Curves continue to be fit to 38 moisture-retention curves from borehole USW UZ-16; several questionable points are being rerun.

Surface-based air-permeability testing continued in borehole USW SD-12. Testing in the Tiva Canyon Tuff unit was completed, and testing was begun in the Topopah Spring unit. No testing was possible in the Paintbrush nonwelded unit due to numerous voids and washouts that prevented setting of the packer assembly.

Prototype holes at the HRF continued to be monitored for the 42nd month; these data are transferred to the USGS facility in Denver for processing, converted to engineering units, and archived on optical disk routinely throughout the month.

As part of percolation in the unsaturated zone studies at the Exploratory Studies Facility (ESF), monitoring of boreholes was continued to detect occurrences of perched water; none was encountered in the ESF. The large-block, prototype ESF percolation experiment, begun in FY94, was continued. In the experiment, the water pressure along the top of a block of fractured welded tuff (47.5 cm long x 54.3 cm wide x 80.6 cm high) is varied and flow rates through the block and pressure distribution in the matrix and fractures are measured. During the month, the average water pressure along the top of the block was +15 cm of water. During the period, the flow rate was intermittent and averaged about 10 cm^3/day. Measurements of water pressure in the block matrix and fracture are being made with tensiometers.

The packer system and all associated support equipment, computers, power supplies, control panels, etc. were installed and successfully tested to begin air-permeability and hydrochemistry testing in the North Ramp Alcoves. The packer system divides the three boreholes into 30 isolated intervals (10 in each borehole). Following installation, the intervals were pumped and hydrochemical gas samples obtained. Results of the gas sample analysis will provide information on the age and travel times of the rock gas. Following gas sampling, cross-hole gas injection testing was begun and will continue over the next several weeks and be followed by cross-hole tracer testing. The cross-hole testing will provide information on the anisotropy and fracture porosity of the welded tuff. Gas samples collected from the radial boreholes were analyzed for CO_2,

CH_4, and $^{12}C/^{13}C$ ratio. No samples were collected for ^{14}C dating during this phase; these will be collected from selected zones after conclusion of cross-hole tracer testing.

In studies to determine gaseous-phase movement in the unsaturated zone, a divergent tracer test was conducted in the North Ramp ESF borehole USW UZ-6 and monitored in boreholes USW N-95 and UZ-6s. SF_6 was injected into the borehole and its arrival time monitored in the other boreholes; arrival times were about 24 hours in borehole USW N-95 and about 48 hours in borehole USW UZ-6s. The data are still being reduced and analyzed. Analysis of shut-in data from boreholes USW SD-9, NRG-2b, NRG-3, and WT-18 has been completed; monitoring is continuing in the boreholes.

In unsaturated zone hydrochemistry studies, four USW UZ-14 and one USW NRG-6 core samples that had previously undergone water extraction via one-dimensional compression were distilled. One USW SD-7 perched water sample was also distilled. The extracted pore-water will be analyzed for tritium. $^{18}O/^{16}O$, and D/H. Sample preparation of about 75 perched water samples from borehole USW SD-7 was completed. The samples were submitted for the following analyses: five for ^{14}C; five for ^{36}Cl; nine for stable isotope analysis; 11 for basic chemistry; and three for tritium and stable isotope check and total organic carbon. Twelve samples were submitted for Sr and U-series isotope analysis; 18 samples were analyzed locally on the ion chromatograph for cation/anion constituents.

In unsaturated-zone fracture-flow modeling studies, a three-dimensional fracture-flow model for the Tiva Canyon part of the ESF north portal area was completed. LBL scientists conducted sensitivity studies on permeability and porosity parameters from the Tiva Canyon, Paintbrush, and Topopah Springs units using TOUGH2. Results indicate that the Paintbrush unit controls the pressure behavior at depth near boreholes USW NRG-6 and USW NRG-7a; further analysis of p[redacted]ions of gas flow at borehole USW UZ-6s show gas age predictions that are a reasonable match to data. The lithium breakthrough data from the tracer test conducted at Raymond Quarry was examined, and it was concluded that Kd concept is not applicable to explain the observed data. The first arrival of lithium occurred at the same time with the conservative tracer for a test at a scale of 30 m. LBL scientists applied the CVA annealing program to invert synthetically-generated transient curves of a constant-rate pumping test. The data were generated by simulating a pump test on a 2-D network of connected fracture elements with one pumping well and seven observation wells. The synthetic data consisted of rise in drawdowns to steady state while the pump was turned on and the fall in drawdowns during the recovery period when the well was shut in. An annealing solution was reached in 8,600 iterations with an energy of 0.8 (initial energy was 52.1). Drawdowns given by the annealing solution match the synthetic transient curves, and upon observation, the annealed fracture network configuration appears quite close to the actual configuration.

In the intermediate site unsaturated-zone flow-model study, a 3-D computational mesh consisting of about 10,000 nodes was created and tested for the region of Yucca Crest around USW UZ-6s; analyses are underway to examine the sensitivity of the gas flow results to mesh design. Pneumatic pressure data from USW NRG-6 and NRG-7 were examined and manipulated into a form that could be utilized by the parameter estimation program (AIRK). Estimates of effective permeability and effective gas porosity were made for the stratigraphic intervals spanned by the upper three instrument stations at each borehole. For intervals in which estimates of permeability could be made, good agreement was obtained between estimates based on the barometric pressure response and those obtained from air-injection tests.

In saturated-zone studies to conduct hydraulic tracer tests at the C-hole complex, since completing the string installations in boreholes UE-25 c#1 and c#2 and the data-acquisition computer initiated, collection of packed-off-zone pressure data has been ongoing. Data continued to be collected through the reporting period,

and periodic uploads of the data through the remote computerized connection to Denver were made. Preparation for cross-hole testing continued.

Collection of water-level data in the site system continued; 19 water-level zones were monitored in 17 wells on a monthly basis (manually) and 17 zones in 12 wells on an hourly basis (transducers). Continuous analog water-level data were obtained in four zones in two wells in order to monitor water-level responses to seismic events. Real-time data were obtained from 17 zones in 12 wells using Data Collection Platforms (DCP's).

Pumping and testing of monitoring wells continued with the compilation, reduction, and analysis of data collected during pumping and recovery of perched water at USW SD-7. Due to erratic water levels during pumping, caused by non-constant pump discharge, methods were developed to digitally filter the data to produce a smooth curve for analysis.

In the site saturated-zone flow-model study, the preliminary 3-D framework model for site area was completed by subsampling regional model; the model documentation was submitted to data review.

WBS 1.2.3.6 - Climatology

In paleoclimate studies of lake, playa and marsh deposits, ostracode identifications from 75 samples from the Jay Quade collection was completed. Mollusks extractions were completed from the reference section at Corn Creek Springs and from another section near Cactus Springs; paleoenvironmental interpretations of those taxa will compared to results obtained by using ostracodes; selected mollusks will also be used for stable and perhaps radiogenic isotope analyses as well as radiocarbon analysis. Initial paleoenvironmental analyses of ostracodes and diatoms from long lacustrine cores in the Owens Valley, Death Valley, and Sevier Basin were completed. Results indicate that the wetter-than-modern conditions have existed for much of the past two million years; dry modern-like intervals do exist, but do not persist for long periods of time. Diatom counts were completed from about 75 samples from the Owens Lake core and about 50 samples from the Death Valley core.

In studies of packrat middens and pollen samples to determine climatic implications of terrestrial paleoecology, materials from 60 recently collected and existing packrat middens were isolated and prepared for submission for radiocarbon dating; material from an additional 20 middens is under preparation. Samples are being obtained from the Pahranagat core for study of pollen, ostracode, diatoms, and molluscs.

Geochronological studies of surface deposits to determine the paleoenvironmental history continued; U and Th isotopic analyses of opaline silica laminae associated with pedogenic deposits from trenches CF1, CF2, and SCT3 were completed. U and Th isotopic analyses of silica-rich pedogenic samples collected from Ghost Dance Fault Trench 1 on top of Whaleback Ridge were completed. U and Th isotopic analyses of samples of carbonate and opaline materials from Trench A1 on Alice Ridge were completed. Mapping of surficial deposits continued of sheets 15 and 16 comprising the east half of the Crater Flat 7.5-minute quadrangle at a 1:12,000 scale. Photointerpretation and field checking of the northern part of the Amargosa Valley 7.5-minute quadrangle continued, noting the southward increase in thickness of the eolian sand mantle on alluvial deposits continuous with those mapped previously to the north.

As part of studies to date calcite vein deposits and determine the effects of future climate conditions on the hydrologic character, 23 calcites from core in drillhole USW SD-12 were sampled and described; about 60

petrographic sections of samples from Rock Valley, Nevares Spring, Site 199, deposits from near Stateline, and the Horsetooth locality were examined and indicate: (1) the material from the low mound north of Hwy. 95 at the mouth of Rock Valley appears to have been deposited as a spring deposit, although it doesn't seem likely that this deposit is recent; (2) the samples form the informally named "Mesquite" Wash section near Stateline, NV have no textures diagnostic of either pedogenic or aqueous depositional settings; spring or lacustrine deposition is suggested by the upper part of the section, which is nearly pure carbonate.

WBS 1.2.13.4 - Water-Resources Monitoring

Ground-water levels were measured at 27 sites and discharge was measured at one flowing well. Completed processing of continual water-level data transmitted via satellite from site AD-6 into project data base. Ground-water data collected during February were checked and filed.

USGS LEVEL 3 MILESTONE REPORT
OCTOBER 1, 1994 - APRIL 30, 1995
Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
LETTER REPORT: GAS CHEMISTRY THRU 1993 Milestone Number: 3GGP120M	12/30/94	06/30/95		
RPT: STRUCT/STRAT OF THE ESF - NORTH RAMP Milestone Number: 3GGF530M	01/31/95	05/31/95		
STUDY PLAN: PALEOCLIMATE/ENVIRONMENTAL SYNTH. Milestone Number: 3GQH50AM	02/28/95	05/31/95		
LETTER REPORT: HYDROGEOLOGY OF WELL JF-3 Milestone Number: 3GWR126M	02/28/95	09/15/95		
CATALOG OF SEISMIC ACTIVITY IN SGB FOR 1994 Milestone Number: 3GSM500M	03/30/95	05/31/95		
LETTER REPORT: SITE SZ CONCEPTUAL MODEL Milestone Number: 3GWM151M	03/30/95	06/30/95		
LTR RPT: FORMATION OF SILICA IN YUCCA MOUNTAIN Milestone Number: 3GQH550M	03/30/95	04/28/95	04/28/95	
ANLYS PPR: MAG/GRAV ALONG SEISMIC PROFILE Milestone Number: 3GGU590M	03/31/95	06/30/95		
PROV RESULTS: PSHA DATA WORKSHOP SUMMARY Milestone Number: 3GSH512M	03/31/95	05/30/95		
PRV RLTS: FAULT DISPLACEMENT METHODOLOGY SUMMARY Milestone Number: 3GSH513M	03/31/95	05/30/95		
LTR RPT: GEOLOGIC STRUCTURES ON GW FLOW Milestone Number: 3GRM167M	03/31/95	05/26/95		
LTR RPT: IN-SITU BOREHOLE MONITORING DATA REPORT Milestone Number: 3GUP421M	03/31/95	06/30/95		

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Deliverable	Due Date	Expected Date	Completed Date	Comments
LTR RPT: STREAMFLOW & PRECIP DATA, FY94 Milestone Number: 3GRS101M	04/14/95	05/15/95		
PRV RLT: SUMMARY SEISMIC SOURCE DATA NEEDS WKSHP Milestone Number: 3GSH514M	04/21/95	05/30/95		
LTR RPT: SURF. DEP. MAP SHEETS 28 AND 22 Milestone Number: 3GCH520M	04/26/95	05/04/95		
LETTER REPORT: 2ND QTR FY95 Milestone Number: 3GWR123M	04/26/95	04/28/95	04/28/95	
DATA TO DOE: PHASE II LITHOLOGIC LOGGING Milestone Number: 3GGU56AM	04/28/95	05/30/95		
PROV RESULTS: SUMMARY DATA ASSESSMENT WORKSHOP Milestone Number: 3GSH502M	04/28/95	05/26/95		
PROV RESULTS: SEISMIC REFLECTION PROFILES Milestone Number: 3GGU540M	05/17/95	05/17/95		
RPT: QUATERNARY FLTING - MINE MTN FLT SYSTEM Milestone Number: 3GTN510M	05/31/95	07/13/95		
FINAL REPORT: DETACHMENT FAULTING Milestone Number: 3GTD500M	05/31/95	06/30/95		
RPT: QUAT. FLT - POSTULATED FORTYMILE WASH FLT Milestone Number: 3GPF520M	05/31/95	05/31/95		
ANLYS PPR: BOW RIDGE/PAINTBRUSH CYN Milestone Number: 3GPF530M	05/31/95	07/31/95		
PROG REPORT: DEATH VAL/FURNACE CRK LEVEL LINES Milestone Number: 3GTM510M	05/31/95	05/31/95		
TECHNICAL REPORT: TECTONIC MODEL(S) Milestone Number: 3GTE500M	05/31/95	08/15/95		

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Deliverable	Due Date	Expected Date	Completed Date	Comments
LTR RPT: SUM ASSESSMT OF KEY DATA/MODELING PROB Milestone Number: 3GRG105M	05/31/95	11/29/95		
DATA TO TDB: FRAMEWORK MODEL DATA (TO EG&G) Milestone Number: 3GWM101M	05/31/95	05/31/95		

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS **PEM:** TYNAN **WBS:** 1.2.3.2.2.1.1

WBS TITLE: Vertical and Lateral Distribution of Stratigraphic Units in the Site Area

P&S ACCOUNT: OG32211

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
1431	1376	1048	-55	-3.8	96.2	328	23.8	131.3	2263	2037	226	10.0	1724	89.7

Analysis

Cumulative Cost Variance:

Cause:

The cost variance is primarily due to the bids for the processing portion of the seismic reflection contract coming in much lower than the budgeted amount. While $348K had been budgeted for this portion of the contract, costs to date are around $20K, resulting in a large positive cost variance.

Impact:

There is no schedule impact resulting from this cost underrun because it is due to lower than planned costs for the same work. There should be little impact to the total cost for this P&S account. Some (approximately $125K) of the positive cost variance is offset by unplanned charges incurred this fiscal year for the acquisition portion of the contract for the seismic reflection line. These costs were to allow complete coverage of the last shothole which required running the line for three additional miles covering twenty-three rather than twenty miles. Additional costs included survey costs, a water truck for dust control which earlier had been indicated was not needed, and rental of an electrical generator.

Corrective Action:

None at this time. There are some cost overruns within this P&S account, which may provide additional offset to this projected cost underrun. Analyses have indicated an underrun of approximately $200K for this P&S account, based on the planned budget. This underrun has been presented to the AM for Scientific Programs as a source of funds for the M&O/WCFS shortfall in WBS 1.2.3.2.8.3.6, Probabilistic Seismic Hazards Analysis; an AFP change form has been submitted to transfer

$180K to the M&O/WCFS for additional support to the USGS for this work. Funds are also needed for other geophysical surveys in conjunction with the seismic reflection that were underfunded due to fiscal limitations, and additional support to magnetic investigations. Possible underrun funds are $20K.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

See "cumulative cost variance"

P&S ACCOUNT MANAGER	**DATE**	**TPO**	**DATE**

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: TYNAN WBS: 1.2.3.2.2.1.2

WBS TITLE: Structural Features Within the Site Area

P&S ACCOUNT: OG32212

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
1436	1357	1546	-79	-5.5	94.5	-189	-13.9	87.8	2887	2983	-96	-3.3	3288	106.5

Analysis

Cumulative Cost Variance:

Cause:

The negative cumulative cost variance results in part from the need to work about one and one-half shifts per day to make up some of the time lost because of delays in the TBM schedule, and in part because of higher than planned relocation costs for moving staff. Also, some of the budget planned for labor was converted to equipment purchases (upgrade of photogrammetry system) at DOE direction. The labor was budgeted linearly, while the procurement is a one time charge which has already been costed resulting in a negative cumulative to date cost variance.

Impact:

A small ($60K) cost overrun is expected in this account at year end.

Corrective Action:

Monitor spending and performance on a monthly basis to minimize schedule delays and cost overruns.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Sullivan WBS: 1.2.3.2.5.2

WBS TITLE: Tectonic Effects Eval Chng in NEBS Result. Tect. Proc.

P&S ACCOUNT: OG3252

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
198	198	82	0.0	0.0	100.0	116	58.6	241.5	265	300	-35	-13.2	110	30.7

Analysis

Cumulative Cost Variance:

Cause:

The positive cumulative cost variance is due to delays in some planned activities. The contract for the drape aeromagnetic survey (approximately $54K) has not yet been awarded. Some staff time in April was diverted to volcanic hazards assessment and probabilistic seismic hazards assessement workshops resulting in lower charges to this account. Paleomagnetic work will be performed in late spring/early summer so costs have not yet been reported for this work. Delays in staffing have resulted in delayed costs, but recent contract hires (February) began conducting tectonic effects on hydrology modeling.

Impact:

There is no impact to the end of the year fiscal year spending based on this cost underrun. In fact, this project is projecting a slight cost overrun ($35K) at the end of the fiscal year as contract costs are incurred, and because subcontract costs for a recently awarded subcontract are approximately $30K greater than planned. Deliverables are still planned to be completed by the end of the fiscal year, as scheduled.

Corrective Action:

Monitor expenditures monthly to minimize cost overruns.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.3.3

WBS TITLE: Ground Motions From Regional Earthquakes and Underground Nuclear Explosions

P&S ACCOUNT: OG32833

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
312	312	289	0	0.0	100.0	23	7.4	108.0	700	536	164	23.4	648	293.9

Analysis

Cumulative Cost Variance:
Not Applicable

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Cause:
The postive variance at completion is temporary and results from adjustments to the EAC to reflect a pending C/SCR transferring $145K to the M&O/WCFS for support to this activity. BAC cannot be adjusted to reflect changes in EAC until C/SCR is approved. Also, funds budgeted for conference room rental ($19K) will not be used.

Impact:
There is no schedule impact to this temporary cost variance because funds being transferred to the M&O were budgeted for M&O support. Work will be completed as planned. The variance at completion currently shows $164K, based on planned budget, but when the pending C/SCR is approved, the BAC will be reduced by $145K, resulting in a variance at complete of only $19K.

Corrective Action:
Update BAC as soon as Implementation Directive for C/SCR is received.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.3.6

WBS TITLE: Probabilistic Seismic Hazards Analyses

P&S ACCOUNT: OG32836

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
183	183	65	0	0.0	100.0	118	64.5	281.5	708	427	281	39.7	252	145.0

Analysis

Cumulative Cost Variance:

Cause:

Costs are accruing at less than the planned rate due to delays in the data needs workshop, which was held April 20-21 in Salt Lake City. The greatest costs associated with this account are labor and travel costs for the group of experts participating in the workshops and documenting results of the workshops. Further, the BCWS has not been adjusted to reflect scope and budget being transferred to the M&O/WCFS per pending C/SCR.

Impact:

There is no impact from this cost variance. The workshop took place in April and costs will catch up with the planned rate. Because costs are direct charged by non-YMPB staff, due to experts being called upon to support the workshop from other USGS branches, there will be some delay in cost accounting. Most costs should clear in May.

Corrective Action:

None required. Workshop has taken place and actual costs should reflect this in May. Pending C/SCR transferring scope and budget should be approved soon, and the Implementation Directive allowing changes to USGS PACS budget will be processed as soon as it is received.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Cause:

The positive variance at complete is temporary and results

from the net of a reduction in budget and scope($461K) resulting from the pending C/SCR transfering scope and budget to the M&O/WCFS, and a projected M&O/WCFS overrun (-$180K) due to greater than planned costs for expert elicitation (a net of +$281K). The BAC cannot be adjusted to reflect the reduction of $461K until the C/SCR is approved.

Impact:

There should be no impact because USGS has identified underruns in other WBS elements (1.2.3.2.2.1.1) to cover the expected overrun of $180K in this account. An AFP change form has been submitted moving funds from WBS 1.2.3.2.2.1.1 to the M&O/WCFS for additional support to this activity. The USGS is projecting that this P&S account will close out on budget at year end as far as USGS expenditures (overrun of $180K is for M&O/WCFS and USGS EAC will not reflect this overrun once the funding change is approved.

Corrective Action:

Make adjustments to BCWS and BAC as soon as the Implementation Directive is received for the pending C/SCR transferring scope and budget in the amount of $461K to the M&O/WCFS. Adjust EAC to reflect only USGS planned expenditures. These two changes will result in BAC being equal to EAC.

P&S ACCOUNT MANAGER	**DATE**	**TPO**	**DATE**

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.4.1

WBS TITLE: Historical and Current Seismicity

P&S ACCOUNT: OG32841

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
936	936	797	0	0.0	100.0	139.0	14.9	117.4	1757	1591	166	9.4	1497	103.4

Analysis

Cumulative Cost Variance:

Cause:

The positive cumulative cost variance is this P&S account results from the workscope in this account being compressed and/or reduced, resulting in lower costs and a slightly increased risk to achieve underrun funding to aid DOE in funding the drilling of UZ-7b (at the request of the AM for Scientific Programs), and lower costs to date because the full field season has not begun. Some funds, in addition to the contract amount, are budgeted for capital equipment assessments for USGS procurement of items for the seismic network upgrade, which are just beginning to be costed.

Impact:

Workscope in this P&S account was compressed and/or reduced as referenced above.

Corrective Action:

An underrun of approximately $166K in this account is expected, based on planned budget; however, an AFP change form has been submitted transferring $95K to LBL for validation of the TOUGH II code under WBS 1.2.3.3.1.2.9, resulting in a funding underrun of about $70K.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.4.4

WBS TITLE: Quaternary Faulting Within Northeast Trending Fault Zone

P&S ACCOUNT: OG32844

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
272	154	117	-118	-43.4	56.6	37	24.0	131.6	370	310	60	16.2	281	111.9

Analysis

Cumulative Cost Variance:
Not Applicable

Cumulative Schedule Variance:

Cause:
The negative schedule variance results from delays in several level 4 milestones (3GTN504M, 3GTN505M, 3GTN512M, and 3GTN524M) and their corresponding level 3 milestones (3GTN500M, 3GTN510M and 3GTN520M). These delays result from poor weather conditions and the need to deepen some trenches and clean debris from others, coordinate photography with EG&G, and excavate fault planes for structural analysis, as well as internal scheduling conflicts of staff among the three summary accounts in this P&S account.

Impact:
As noted above, three level 3 milestones have been delayed from 1-2 months; however, all milestones will be completed within the fiscal year.

Corrective Action:
Take actions to reduce milestone delays and monitor progress of scheduled milestones on a monthly basis to ensure completion this fiscal year.

Variance At Complete:

Cause:
The positive variance at completion results from work costing less than originally planned and budgeted.

Impact:
There is no impact to this cost variance. Milestones will be completed within the fiscal year.

Corrective Action:
Monitor expenditures and update EAC monthly.

P&S ACCOUNT MANAGER	DATE	TPO	DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: SULLIVAN WBS: 1.2.3.2.8.4.10

WBS TITLE: Geodetic Leveling

P&S ACCOUNT: OG3284A

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
171	161	54	-10	-5.8	94.2	107	66.5	298.1	200	173	27	13.5	67	32.8

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is this P&S account results from the Memoranda of Agreement (MOAs) being signed later in the year than planned, resulting in lagging costs.

Impact:

No long-term schedule impacts are expected as work was started before the MOAs were signed; work is expected to be completed in the near future at less than the planned cost. There is expected to be a cost underrun of approximately $27K in this account as reflected in the estimate at completion.

Corrective Action:

None required.

Cumulative Schedule Variance:

Not Applicable

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: PATTERSON WBS: 1.2.3.3.1.1.1

WBS TITLE: Precipitation and Meteorological Monitoring for Regional Hydrology

P&S ACCOUNT: OG33111

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
191	191	67	0	0.0	100.0	124	64.9	285.1	320	214	106	33.1	112	87.8

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is the result of two unplanned vacancies, and delay in filling a third vacancy.

Impact:

Due to staffing shortages, some of the planned work for FY1995 will not be completed. Level 3 milestones 3GMM107M, LTR RPT:Analysis Regional Storm Events, and 3GGM108M, LTR RPT:Analysis Site Meteorological Data will not be completed. This account is expected to underrun about $106K from the planned budget.

Corrective Action:

A report currently in process documents analysis of regional storm types through FY1993; analysis through FY1994 is not needed. Statistical analysis of FY1994 site meteorological data has been performed already and incorporated in a report currently in review that was intended originally to document conditions only through FY1993. A C/SCR is in process by the M&O to transfer $91K of the projected underrun funds to the M&O for peer reviews, resulting in a final projected underrun of only about $7K.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Patterson WBS: 1.2.3.3.1.1.4

WBS TITLE: Regional Hydrologic System Synthesis & Modeling

P&S ACCOUNT: OG33114

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
220	193	78	-27	-12.3	87.7	115	59.6	247.4	450	423	27	6.0	182	74.5

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is due to delays in contracts for:

1) support for conversion of the model to MODFLOWP, and

2) analytical element modeling.

Impact:

1) Conversion of the model to MODFLOWP is proceeding slower than expected; however work is continuing on forward calibration of the MODFLOW model, which will move ahead of schedule. Work will balance out and the only impact should be to the completion date of the model conversion itself.

2) All activities and milestones associated with analytical element modeling will be delayed, due to time needed to finalize the contract, which is being re-negotiated due to modifications in the schedule for deliverables and the contract completions date. Modifications were sent to the contractor on 4/24/95, and response is pending. Boundary conditions will continue to be evaluated by using the existing regional MODFLOW flow model. The net effect on USGS modeling activities is minimal because boundary conditions can be done using MODFLOW and MODFLOWP; draft results of the analytical-element model to PA will be provided as required by the PA schedule.

Corrective Action:

1) Contract is in place and efforts will be accelerated to complete the conversion with minimal delay.

2) Proposal has been received from the University of Minnesota. This proposal will be reviewed and resolved as quickly as possible so work may proceed. Proposal includes additional person, at increased cost, that may slightly accelerate progress. Contract

modifications havse been submitted to the contractor moving up both the schedule for deliverables and the contract completion date.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER	DATE	TPO	DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: PATTERSON WBS: 1.2.3.3.1.2.4

WBS TITLE: Percolation in the Unsaturated Zone - ESF Study

P&S ACCOUNT: OG33124

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
816	816	545	0	0.0	100.0	271.0	33.2	149.7	1393	1274	119	8.5	931	79.1

Analysis

Cumulative Cost Variance:

Cause:

Underspending in two of the five summary accounts encompasses 90% of the P&S level cost variance. Underspending in summary account OG33124E97 (Air-K & Hydrochemistry Testing - North Ramp Alcoves, 186K) is due to 1) lower than expected federal labor hours for ESF alcove testing due to the current priority on testing in surface-based boreholes along the ESF alignment, and a 2 to 3 month delay in construction of alcove 2, and 2) delays in procurement of supplies and equipment to support air-K testing, gaseous hydrochemical sampling, and long-term monitoring of boreholes in ESF alcoves, especially alcove 2. Underspending in summary account OG33124A96 (North Ramp Perched Water, 59K) is due to 1) lower than expected federal labor hours for ESF testing because no perched water has been encountered in the ESF, and 2) delays in procurement of supplies and equipment to support perched-water sampling and monitoring.

Impact:

There is expected to be a cost underrun of $$119K at the end of the fiscal year. Supplies and equipment originally scheduled for procurement in October and November 1994 are for testing and monitoring primarily in Alcove 2 which won't begin until June and Alcove 3, which is not scheduled for testing until September 1995. Delays in procurement of supplies and equipment for alcove testing did not have a serious impact because of a delay of three months in the start of testing for alcove 2, with similar delays in testing of alcove 3 expected.

Corrective Action:

Technician vacancy for ESF air-K testing was filled during second quarter FY 95. All supplies and equipment to support ESF air-K, hydrochemistry, and perched-water testing will be procured in time to accommodate ESF-testing schedules.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER	DATE	TPO	DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Patterson WBS: 1.2.3.3.1.2.7

WBS TITLE: Unsaturated Zone Hydrochemistry

P&S ACCOUNT: OG33127

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
478	478	367	0.0	0.0	100.0	111	23.2	130.2	1005	954	51	5.1	772	89.8

Analysis

Cumulative Cost Variance:

Cause:

The positive cumulative cost variance results from reductions in the estimated cost of hydrochemical sample analyses due to fewer samples being available from the surface-based drilling program and ESF, and deferral in hiring of a contract hydrochemical technician for pore-water extraction.

Impact:

There is a projected cost underrun of $51K in this account. There is no schedule impact resulting from this cost underrun as the reduction in the number of pore-water and gas samples is justified given the current drilling and ESF schedules, and current staff can extract pore water as fast as current equipment configuration will allow.

Corrective Action:

Projected variance at completion is being monitored and updated monthly. An additional technician will be hired once an additional set of drainage plates is available for the load cell allowing additional production.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: PATTERSON WBS: 1.2.3.3.1.3.1

WBS TITLE: Site Saturated Zone Groundwater Flow System

P&S ACCOUNT: OG33131

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
717	717	649	0	0.0	100	68.0	9.5	110.5	1200	1325	-125	-10.4	1086	71.4

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

The negative variance at completion results from large unplanned relocation costs for recently hired staff, and from work costing more than originally budgeted.

Impact:

This account is expected to be in a cost overrun situation at the end of the year. Cost underruns are expected in other USGS accounts which can be used to offset the overrun.

Corrective Action:

Monitor expenditures monthly to minimize cost overruns.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: PATTERSON WBS: 1.2.3.6.2.1.4

WBS TITLE: Paleoenvironmental History of Yucca Mountain

P&S ACCOUNT: OG36214

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
384	384	355	0	0.0	100.0	29	7.6	108.2	910	647	263	28.9	841	180.1

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:

The positive variance at completion results in part from $185K planned for LBL to support Quaternary dating activities being carried as part of the USGS budget for geochronological studies. Additional cost variances result from work costing less than the budgeted amount in the surficial deposits mapping activity.

Impact:

There is no expected impact resulting from this variance at completion. Work is expected to be completed. Underrun at year end is expected to be about $78K.

Corrective Action:

A C/SCR and AFP change form have been submitted transferring scope and budget valued at $185K to LBL. Estimate to complete will be updated monthly to reflect actual funding underrun projection.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: PATTERSON WBS: 1.2.3.6.2.2.1

WBS TITLE: Quaternary Regional Hydrology

P&S ACCOUNT: OG36221

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
525	525	332	0	0.0	100.0	193.0	36.8	158.1	720	733	-13.0	-1.8	455	48.6

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance is in summary account OG36221E95 and is due to delay in the lease of a mass spectrometer and automated carbonate device for small samples, originally planned for February 1995. A contract for the lease has not yet been awarded.

Impact:

There is no impact to the delay in the leasing contract as the existing mass spectrometer is able to handle the pre-summer season sample load. The leasing contract is expected to be awarded in June 1995 and available for the expected high summer load of samples. A cost overrun of about $13K is projected.

Corrective Action:

No corrective action is required. Mass spectrometer will be available for summer field season.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Gil WBS: 1.2.5.2.2

WBS TITLE: Site Characterization Program

P&S ACCOUNT: OG522

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
317	317	168	0	0.0	100.0	149	47.0	188.7	558	450	108	19.4	296	85.5

Analysis

Cumulative Cost Variance:

Cause:

The positive cost variance results from lower than planned spending in this level of effort account. This account needs to be reviewed regularly for planned spending for the balance of the fiscal year. To date no charges have been incurred in the account set up for issue resolution, and charges to the volcanic hazards assessment work have been minimal but are beginning to increase to the planned rate.

Impact:

There is no impact to work being performed in this level of effort account. This account is currently projecting a cost underrun of about $108K at the end of the year.

Corrective Action:

Actual and planned spending will be closely reviewed on a monthly basis to update the estimate at completion to accurately reflect the estimated underrun.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Iorii WBS: 1.2.9.1.2.1

WBS TITLE: Technical Project Office Management

P&S ACCOUNT: OG9121

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
194	194	325	0.0	0.0	100.0	-131	-67.5	59.7	436	539	-103	-23.6	730	113.1

Analysis

Cumulative Cost Variance:

Cause:

The negative cumulative cost variance is primarily due to continuing costs being incurred in the relocation of USGS offices, as well as costs incurred in moving additional personnel to new space. Additional space was recently required to be added, and costs for moving personnel, phone and computer lines for this space was unplanned.

Impact:

Account is expecting to be in a cost overrun situation at the end of the fiscal year as reflected in the estimate at completion. However, it is believed that USGS has adequate projected underrun to cover this anticipated overrun.

Corrective Action:

Ensure adequate cost underruns to cover anticipated cost overruns. Monitor expenditures closely on a monthly basis to minimize cost overruns.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Spence WBS: 1.2.11.5

WBS TITLE: Quality Assurance - Quality Engineering

P&S ACCOUNT: OGB5

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
250	250	176	0.0	0.0	100.0	74	29.6	142.0	430	380	50	11.6	303	88.2

Analysis

Cumulative Cost Variance:

Not applicable.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Cause:
The positive variance at completion results from delays in hiring planned staff, and direction from DOE to return $60K to the Office of Quality Assurance (OQA).

Impact:
There is no impact.

Corrective Action:
No corrective action required. $60K has been made available from the Quality Assurance budget to OQA.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Dixon WBS: 1.2.13.4.7

WBS TITLE: Water Resources

P&S ACCOUNT: OGD47

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	ICPI
478	481	218	3	0.6	100.6	263	54.7	220.6	977	977	0.0	0.0	443	69.2

Analysis

Cumulative Cost Variance:

Cause:

This account is showing a positive cumulative cost variance due to delays in procuring large value items. There is approximately $225K planned for procurements in this account, of which none has been costed.

Impact:

There is no impact to this cost variance. Procurements are expected to be completed. Milestones will be met, and budgeted costs will be incurred before fiscal year end.

Corrective Action:

None required. An AFP change form has been submitted converting an additional $165K from operating funds to capital equipment funds. A requisition has been prepared to procure needed equipment items.

Cumulative Schedule Variance:

Not applicable.

Variance At Complete:

Not applicable.

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mountain Site Characterization Project
Variance Analysis Report
Status Thru: April 30, 1995

PARTICIPANT: USGS PEM: Hamilton-Ray WBS: 1.2.15.2.3

WBS TITLE: Support and Personnel Services

P&S ACCOUNT: OGF23

FY 1995 Cumulative to Date									FY 1995 at Completion					
BCWS	BCWP	ACWP	SV	SV%	SPI	CV	CV%	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
1101	1101	1235	0	0.0	100.0	-134	-12.2	89.1	1883	2036	-153	-8.1	2113	97.6

Analysis

Cumulative Cost Variance:

Cause:

The negative cumulative cost variance in this account is due to costs incurring at a greater than planned rate in two summary accounts. The space and facilities account (0GF2395B2) was underestimated at the beginning of the year, and as staffing has increased, it was necessary to add on to the leased space resulting in additional projected overruns. The other account that is overrunning is the administrative support account, again due to increased staffing requirements, administrative support required greater than planned staffing to support increased personnel actions, procurements, etc.

Impact:

This P&S account will overrun at fiscal year end.

Corrective Action:

Monitor spending closely to ensure cost overruns are minimized. If projected overrun exceed underrun funds available within this third level WBS element, prepare AFP change form moving funds from USGS accounts expected to underrun to cover the expected overrun in this account.

Cumulative Schedule Variance:
Not applicable.

Variance At Complete:

See "Cumulative Cost Variance"

P&S ACCOUNT MANAGER DATE TPO DATE

Yucca Mtn. Site Char. Project-Planning & Control System
PACS Participant Work Station (PPWS)
Data Analysis Report

Summary Level P & S - Detail Level SA

1. Participant: USGS
2. Dollars in: Thousands (Unescalated)
3. Report date: 11-May-1995
4. Data Type: CUMULATIVE
5. Location: Denver, Colorado
6. Project Name: Yucca Mountain Project
7. Reporting Period: 1-Oct-1994 to 30-Apr-1995

8. WBS Number 9. Number & Title	BCWS	BCWP	ACWP	Pct Sched	Pct Cmplt	Pct Spent	Schedule			Cost			FY at completion					
							SV $	SV %	SPI	CV $	CV %	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
OG16 Technical Interface	62	62	25	56.9	56.9	22.9	0	0.0	100.0	37	59.7	248.0	109	66	43	39.4	44	114.6
OG1695B Technical Interface	6	6	0	54.5	54.5	0.0	0	0.0	100.0	6	100.0	0.0	11	8	3	27.3	0.0	62.5
OG1695B1 Special Studies	56	56	25	57.1	57.1	25.5	0	0.0	100.0	31	55.4	224.0	98	58	40	40.8	44	127.3
OG1A Q-List Development and Maintenance	14	14	4	56.0	56.0	16.0	0	0.0	100.0	10	71.4	350.0	25	14	11	44.0	7	110.0
OG1A95B Q-List Development and Maintenance	14	14	4	56.0	56.0	16.0	0	0.0	100.0	10	71.4	350.0	25	14	11	44.0	7	110.0
OG312 Participant Management and Integration	1243	1242	1167	58.1	58.1	54.6	-1	-0.1	99.9	75	6.0	106.4	2138	2207	-69	-3.2	2009	86.2
OG31295B1 ESI Science Advisory Group	93	93	80	57.8	57.8	49.7	0	0.0	100.0	13	14.0	116.3	161	160	1	0.6	138	85.0
OG31295B2 Nevada Operations	114	114	146	57.9	57.9	74.1	0	0.0	100.0	-32	-28.1	78.1	197	282	-85	-43.1	252	61.0
OG31295B3 Tracer Gas Support	47	47	54	58.8	58.8	67.5	0	0.0	100.0	-7	-14.9	87.0	80	84	-4	-5.0	92	110.0
OG31295B5 YMPB Computer Operations	240	240	236	57.7	57.7	56.7	0	0.0	100.0	4	1.7	101.7	416	404	12	2.9	409	104.8
OG31295B6 YMPB Scientific Rpts/Project Documents	133	133	118	58.8	58.8	52.2	0	0.0	100.0	15	11.3	112.7	226	196	30	13.3	201	119.2

1. Participant: USGS	2. Dollars in: Thousands (Unescalated)	3. Report date: 11-May-1995	4. Data Type: CUMULATIVE
5. Location: Denver, Colorado	6. Project Name: Yucca Mountain Project	7. Reporting Period: 1-Oct-1994 to 30-Apr-1995	

8. WBS Number 9. Number & Title	BCWS	BCWP	ACWP	Pct Sched	Pct Cmplt	Pct Spent	Schedule			Cost			FY at completion					
							SV $	SV %	SPI	CV $	CV %	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
0G31295B7 Earth Science Investigations (ESI)	347	347	332	57.8	57.8	55.3	0	0.0	100.0	15	4.3	104.5	600	623	-23	-3.8	574	86.9
0G31295B8 ESI QA Implementation	257	257	190	58.7	58.7	43.4	0	0.0	100.0	67	26.1	135.3	438	438	0	0.0	324	73.0
0G31295C1 Tracer Gas Support Equipment	12	11	11	60.0	55.0	55.0	-1	-8.3	91.7	0	0.0	100.0	20	20	0	0.0	20	100.0
0G32211 Vert. and Lat. Dist. of Strat. Units in Site Area	1431	1376	1048	63.2	60.8	46.3	-55	-3.8	96.2	328	23.8	131.3	2263	2059	204	9.0	1724	87.7
0G32211B96 Update 3D models lithostrat/structural/rock prop	203	203	223	58.0	58.0	63.7	0	0.0	100.0	-20	-9.9	91.0	350	350	0	0.0	385	115.7
0G32211C95 Results of Measured Sections in Site Area	184	184	157	73.6	73.6	62.8	0	0.0	100.0	27	14.7	117.2	250	300	-50	-20.0	213	46.2
0G32211D95 Geophysics White Paper, Phase II	55	55	26	100.0	100.0	47.3	0	0.0	100.0	29	52.7	211.5	55	26	29	52.7	26	0.0
0G32211E96 Regional Seismic Reflection Profiles	528	528	244	81.9	81.9	37.8	0	0.0	100.0	284	53.8	216.4	645	427	218	33.8	298	63.9
0G32211F96 Integration of Geology and Geophysics	66	66	64	44.0	44.0	42.7	0	0.0	100.0	2	3.0	103.1	150	168	-18	-12.0	145	80.8
0G32211G96 Lithologic Logging of Core	199	163	154	52.4	42.9	40.5	-36	-18.1	81.9	9	5.5	105.8	380	340	40	10.5	359	116.7
0G32211H95 Magnetic Investigations - YM/Jet Ridge	15	15	26	34.1	34.1	59.1	0	0.0	100.0	-11	-73.3	57.7	44	44	0	0.0	76	161.1

1. Participant: USGS	2. Dollars in: Thousands (Unescalated)	3. Report date: 11-May-1995	4. Data Type: CUMULATIVE
5. Location: Denver, Colorado	6. Project Name: Yucca Mountain Project	7. Reporting Period: 1-Oct-1994 to 30-Apr-1995	

8. WBS Number 9. Number & Title	BCWS	BCWP	ACWP	Pct Sched	Pct Cmplt	Pct Spent	Schedule			Cost			FY at completion					
							SV $	SV %	SPI	CV $	CV %	CPI	BAC	EAC	VAC	VAC%	IEAC	TCPI
OG32211J95 Magnetic/Gravity Investigations, at YM	63	44	29	100.0	69.8	46.0	-19	-30.2	69.8	15	34.1	151.7	63	55	8	12.7	42	73.1
OG32211K96 Mag Along Seismic Profile, Crater Flat, YM	34	34	27	42.5	42.5	33.8	0	0.0	100.0	7	20.6	125.9	80	80	0	0.0	64	86.8
OG32211L96 Strat Desc of Bullfrog & Tram Tuffs	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	120	115	5	4.2	0.0	104.3
OG32211M95 Lithology & Hydrologic Properties in the PTn	52	52	58	68.4	68.4	76.3	0	0.0	100.0	-6	-11.5	89.7	76	81	-5	-6.6	85	104.3
OG32211Q95 Mag/Grav Studies to Locate Volcanic Drill Holes	32	32	40	64.0	64.0	80.0	0	0.0	100.0	-8	-25.0	80.0	50	73	-23	-46.0	63	54.5
OG32212 Structural Features within the Site Area	1436	1357	1546	49.7	47.0	53.6	-79	-5.5	94.5	-189	-13.9	87.8	2887	2983	-96	-3.3	3288	106.5
OG32212A95 Enhance Surface Geologic Maps	206	185	233	77.2	69.3	87.3	-21	-10.2	89.8	-48	-25.9	79.4	267	276	-9	-3.4	336	190.7
OG32212B95 Geometry & Continuity of the Sundance Fault	164	164	222	63.6	63.6	86.0	0	0.0	100.0	-58	-35.4	73.9	258	297	-39	-15.1	349	125.3
OG32212C96 Expanded Surface Geology Mapping	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	80	92	-12	-15.0	0.0	87.0
OG32212D96 Mapping in the ESF	932	874	996	46.4	43.5	49.6	-58	-6.2	93.8	-122	-14.0	87.8	2010	2035	-25	-1.2	2289	109.3

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0G32212E95 Vert Continuity of Fracture/Char-Paintbrush Grp	95	95	56	63.3	63.3	37.3	0	0.0	100.0	39	41.1	169.6	150	141	9	6.0	88	64.7
0G32212F95 Pavement Mapping At Fran Ridge	39	39	39	78.0	78.0	78.0	0	0.0	100.0	0	0.0	100.0	50	56	-6	-12.0	50	64.7
0G32212G96 Verif & Enhance Scott & Bonk-Jet Ridge/Midway Val	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	72	86	-14	-19.4	0.0	83.7
0G3252 Tect. Eff: Eval Chng in NEBS Result. Tect. Proc.	198	198	82	74.7	74.7	30.9	0	0.0	100.0	116	58.6	241.5	265	300	-35	-13.2	110	30.7
0G3252A95 Structural Controls on Basaltic Volcanism, YM	117	117	36	70.9	70.9	21.8	0	0.0	100.0	81	69.2	325.0	165	165	0	0.0	51	37.2
0G3252C95 Tectonic Effects on YM Hydrologic System	81	81	46	81.0	81.0	46.0	0	0.0	100.0	35	43.2	176.1	100	135	-35	-35.0	57	21.3
0G32623 Surface Facil. Field Tests & Char. Meas.	19	19	4	55.9	55.9	11.8	0	0.0	100.0	15	78.9	475.0	34	32	2	5.9	7	53.6
0G32623A95 Technical Support for Soil and Rock	19	19	4	55.9	55.9	11.8	0	0.0	100.0	15	78.9	475.0	34	32	2	5.9	7	53.6
0G32722 Site Ambient Thermal Conditions	98	98	74	60.9	60.9	46.0	0	0.0	100.0	24	24.5	132.4	161	161	0	0.0	122	72.4
0G32722A96 Collect/Interpret Heat Flow Data	98	98	74	60.9	60.9	46.0	0	0.0	100.0	24	24.5	132.4	161	161	0	0.0	122	72.4

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OG32831 Relevant Earthquake Sources	106	106	92	58.2	58.2	50.5	0	0.0	100.0	14	13.2	115.2	182	172	10	5.5	158	95.0
OG32831A95 Synthesis of Geol/Geophys/Seismic Data	106	106	92	58.2	58.2	50.5	0	0.0	100.0	14	13.2	115.2	182	172	10	5.5	158	95.0
OG32833 Grd. Mot. from Region. Erthqu. & U/G Nucl. Explos.	312	312	289	44.6	44.6	41.3	0	0.0	100.0	23	7.4	108.0	700	536	164	23.4	648	157.1
OG32833A95 Ground Motion Attenuation	132	132	111	44.0	44.0	37.0	0	0.0	100.0	21	15.9	118.9	300	293	7	2.3	252	92.3
OG32833B96 Ground Motion Modeling	180	180	178	45.0	45.0	44.5	0	0.0	100.0	2	1.1	101.1	400	243	157	39.3	396	338.5
OG32836 Probabilistic Seismic Hazards Analyses	183	183	65	25.8	25.8	9.2	0	0.0	100.0	118	64.5	281.5	708	427	281	39.7	252	145.0
OG32836A95 GM Char in Prob. Seismic Hazard Analysis	42	42	11	18.7	18.7	4.9	0	0.0	100.0	31	73.8	381.8	225	42	183	81.3	59	590.3
OG32836B95 Probabilistic Seismic Hazard Analysis	141	141	54	29.2	29.2	11.2	0	0.0	100.0	87	61.7	261.1	483	385	98	20.3	185	103.3
OG32841 Historical and Current Seismicity	936	936	797	53.3	53.3	45.4	0	0.0	100.0	139	14.9	117.4	1757	1591	166	9.4	1497	103.4
OG32841A95 Catalog of Seismic Activity	483	483	375	58.3	58.3	45.3	0	0.0	100.0	108	22.4	128.8	828	682	146	17.6	643	112.4
OG32841B95 Excavation Induced Seismic Activity	42	42	39	58.3	58.3	54.2	0	0.0	100.0	3	7.1	107.7	72	68	4	5.6	67	103.4

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OG32841C95 Digital Upgrade SGB Seismic Network Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	156	156	0	0.0	0.0	100.0
OG32841C96 Digital Upgrade SGB Seismic Network	275	275	268	57.9	57.9	56.4	0	0.0	100.0	7	2.5	102.6	475	460	15	3.2	463	104.2
OG32841D95 Precarious Rock Methodology	41	41	46	67.2	67.2	75.4	0	0.0	100.0	-5	-12.2	89.1	61	60	1	1.6	68	142.9
OG32841E95 Strong Motion Array	95	95	69	57.6	57.6	41.8	0	0.0	100.0	26	27.4	137.7	165	165	0	0.0	120	72.9
OG32843 Quaternary Faulting Within 100 km of Yucca Mountai	461	405	374	61.0	53.6	49.5	-56	-12.1	87.9	31	7.7	108.3	756	792	-36	-4.8	698	84.0
OG32843A95 Quaternary Faulting - Amargosa Desert	83	71	49	61.9	53.0	36.6	-12	-14.5	85.5	22	31.0	144.9	134	134	0	0.0	92	74.1
OG32843B95 Quaternary Faulting - Regional Faults	180	152	93	62.1	52.4	32.1	-28	-15.6	84.4	59	38.8	163.4	290	290	0	0.0	177	70.1
OG32843C95 Quaternary Flting - Bare Mtn Fault Zone	103	87	89	55.7	47.0	48.1	-16	-15.5	84.5	-2	-2.3	97.8	185	221	-36	-19.5	189	74.2
OG32843D95 Char Death Valley-Furnace Creek Flt. Zone	95	95	143	64.6	64.6	97.3	0	0.0	100.0	-48	-50.5	66.4	147	147	0	0.0	221	*****
OG32844 Quaternary Faulting in NE-Trending Fault Zones	272	154	117	73.5	41.6	31.6	-118	-43.4	56.6	37	24.0	131.6	370	310	60	16.2	281	111.9

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0G32844A95 Quaternary Fltling Rock Valley Flt Sys	183	96	88	73.2	38.4	35.2	-87	-47.5	52.5	8	8.3	109.1	250	206	44	17.6	229	130.5
0G32844B95 Quaternary Flting - Mine Mtn Flt System	44	35	15	88.0	70.0	30.0	-9	-20.5	79.5	20	57.1	233.3	50	44	6	12.0	21	51.7
0G32844C95 Quaternary Flting - Cane Springs Flt System	45	23	14	64.3	32.9	20.0	-22	-48.9	51.1	9	39.1	164.3	70	60	10	14.3	43	102.2
0G32845 Detachment Faults	201	172	119	87.4	74.8	51.7	-29	-14.4	85.6	53	30.8	144.5	230	230	0	0.0	159	52.3
0G32845A95 Detachment Faults	201	172	119	87.4	74.8	51.7	-29	-14.4	85.6	53	30.8	144.5	230	230	0	0.0	159	52.3
0G32846 Quaternary Faulting Within the Site Area	339	328	266	71.4	69.1	56.0	-11	-3.2	96.8	62	18.9	123.3	475	459	16	3.4	385	76.2
0G32846A95 Quat Flting-Solitario Cyn/Crater Flt/Windy Wash	135	135	89	62.2	62.2	41.0	0	0.0	100.0	46	34.1	151.7	217	165	52	24.0	143	107.9
0G32846B95 Quaternary Flting - Ghost Dance Flt	86	86	70	69.9	69.9	56.9	0	0.0	100.0	16	18.6	122.9	123	128	-5	-4.1	100	63.8
0G32846C95 Quaternary Flting - Post Fortymile Wash Flt	39	39	14	86.7	86.7	31.1	0	0.0	100.0	25	64.1	278.6	45	41	4	8.9	16	22.2
0G32846D95 Quat Flting-Bow Ridge/Paintbrush Cyn/Stagecoach	79	68	93	87.8	75.6	103.3	-11	-13.9	86.1	-25	-36.8	73.1	90	125	-35	-38.9	123	68.8

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0G32848 Stress Field Within and Proximal to the Site Area	10	10	3	100.0	100.0	30.0	0	0.0	100.0	7	70.0	333.3	10	3	7	70.0	3	0.0
0G32848A95 In-situ Stress Measurements	10	10	3	100.0	100.0	30.0	0	0.0	100.0	7	70.0	333.3	10	3	7	70.0	3	0.0
0G3284A Geodetic Leveling	171	161	54	85.5	80.5	27.0	-10	-5.8	94.2	107	66.5	298.1	200	173	27	13.5	67	32.8
0G3284AA95 Geodetic Leveling	113	97	33	86.9	74.6	25.4	-16	-14.2	85.8	64	66.0	293.9	130	103	27	20.8	44	47.1
0G3284AB95 Death Valley/Furnace Creek Leveling	58	64	21	82.9	91.4	30.0	6	10.3	110.3	43	67.2	304.8	70	70	0	0.0	23	12.2
0G3284C Tectonic Models and Synthesis	137	117	92	58.3	49.8	39.1	-20	-14.6	85.4	25	21.4	127.2	235	273	-38	-16.2	185	65.2
0G3284CA96 Tectonic Models and Synthesis	137	117	92	58.3	49.8	39.1	-20	-14.6	85.4	25	21.4	127.2	235	273	-38	-16.2	185	65.2
0G33111 Precip. & Meteor. Monitor. for Region. Hydrology	191	191	67	59.7	59.7	20.9	0	0.0	100.0	124	64.9	285.1	320	214	106	33.1	112	87.8
0G33111A96 Char of the Meteorology for Regional Hydrology	191	191	67	59.7	59.7	20.9	0	0.0	100.0	124	64.9	285.1	320	214	106	33.1	112	87.8
0G33112 Runoff and Streamflow	295	290	228	73.9	72.7	57.1	-5	-1.7	98.3	62	21.4	127.2	399	402	-3	-0.8	314	62.6
0G33112A95 Streamflow Data, FY94	84	79	65	94.4	88.8	73.0	-5	-6.0	94.0	14	17.7	121.5	89	101	-12	-13.5	73	27.8

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OG33112B96 Streamflow Data, FY95	211	211	163	68.1	68.1	52.6	0	0.0	100.0	48	22.7	129.4	310	301	9	2.9	240	71.7
OG33113 Regional Ground-Water Flow System	157	138	85	62.8	55.2	34.0	-19	-12.1	87.9	53	38.4	162.4	250	245	5	2.0	154	70.0
OG33113A95 Assessment of Key Data/Modeling Problems	71	52	42	65.7	48.1	38.9	-19	-26.8	73.2	10	19.2	123.8	108	150	-42	-38.9	87	51.9
OG33113C95 Fortymile Wash Recharge	86	86	43	60.6	60.6	30.3	0	0.0	100.0	43	50.0	200.0	142	95	47	33.1	71	107.7
OG33114 Regional Hydrologic System Synthesis and Modeling	220	193	78	48.9	42.9	17.3	-27	-12.3	87.7	115	59.6	247.4	450	423	27	6.0	182	74.5
OG33114A96 Regional SZ Numerical Flow Model	106	106	46	63.9	63.9	27.7	0	0.0	100.0	60	56.6	230.4	166	163	3	1.8	72	51.3
OG33114B96 SZ Flow Model Boundary Conditions Evaluation	60	33	13	33.1	18.2	7.2	-27	-45.0	55.0	20	60.6	253.8	181	147	34	18.8	71	110.4
OG33114C96 Regional SZ Hydrogeologic Framework Model	54	54	19	52.4	52.4	18.4	0	0.0	100.0	35	64.8	284.2	103	113	-10	-9.7	36	52.1
OG33121 Unsaturated Zone Infiltration	753	753	727	56.6	56.6	54.7	0	0.0	100.0	26	3.5	103.6	1330	1351	-21	-1.6	1284	92.5
OG33121A96 Infiltration Properties	335	335	331	56.0	56.0	55.4	0	0.0	100.0	4	1.2	101.2	598	614	-16	-2.7	591	92.9
OG33121B95 Infiltration Processes Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	30	30	0	0.0	0.0	100.0

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OG33121B96 Infiltration Processes	275	275	241	60.0	60.0	52.6	0	0.0	100.0	34	12.4	114.1	458	458	0	0.0	401	84.3
OG33121C95 Infiltration Distribution	143	143	155	58.6	58.6	63.5	0	0.0	100.0	-12	-8.4	92.3	244	249	-5	-2.0	264	107.4
OG33123 Perc. in the Unsaturated Zone - Surf. Based Study	1836	1666	1630	60.2	54.6	53.4	-170	-9.3	90.7	36	2.2	102.2	3050	3159	-109	-3.6	2984	90.5
OG33123A96 Matrix Properties of Hydrogeologic Units	276	276	228	65.6	65.6	54.2	0	0.0	100.0	48	17.4	121.1	421	429	-8	-1.9	348	72.1
OG33123B95 Surface-Based Air-Permeability Testing	378	378	328	72.7	72.7	63.1	0	0.0	100.0	50	13.2	115.2	520	630	-110	-21.2	451	47.0
OG33123C95 Vertical Seismic Profiling Test	176	111	173	61.5	38.8	60.5	-65	-36.9	63.1	-62	-55.9	64.2	286	236	50	17.5	445	277.8
OG33123D95 Drilling & Drillhole Instrumentation	414	414	389	61.2	61.2	57.5	0	0.0	100.0	25	6.0	106.4	677	734	-57	-8.4	636	76.2
OG33123E95 Sensor Calibration & In-Situ Testing	264	190	270	59.1	42.5	60.4	-74	-28.0	72.0	-80	-42.1	70.4	447	460	-13	-2.9	635	135.3
OG33123F95 UZ Monit, DataBase Mgnt, QA Support, & Comp Serv	209	209	189	62.4	62.4	56.4	0	0.0	100.0	20	9.6	110.6	335	335	0	0.0	303	86.3
OG33123G95 Integrated Data Analysis and Interpretation	100	69	33	62.5	43.1	20.6	-31	-31.0	69.0	36	52.2	209.1	160	130	30	18.8	77	93.8

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OG33123H95 Surface-Based Air-Permeability Testing Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	32	32	0	0.0	0.0	100.0
OG33123I95 Drilling and Drillhole Instrumentation Equipment	19	19	20	100.0	100.0	105.3	0	0.0	100.0	-1	-5.3	95.0	19	20	-1	-5.3	20	0.0
OG33123J95 Drilling and Drillhole Instrumentation Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	18	18	0	0.0	0.0	100.0
OG33123K95 Drilling and Drillhole Instrumentation Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	35	35	0	0.0	0.0	100.0
OG33123L95 Matrix Properties Hydrogeologic Units Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	100	100	0	0.0	0.0	100.0
OG33124 Percolation in the Unsaturated Zone - ESF Study	816	816	545	58.6	58.6	39.1	0	0.0	100.0	271	33.2	149.7	1393	1274	119	8.5	931	79.1
OG33124A96 North Ramp Perched Water Testing	108	108	49	67.1	67.1	30.4	0	0.0	100.0	59	54.6	220.4	161	147	14	8.7	73	54.1
OG33124B95 Percolation Test in the ESF	68	68	58	81.9	81.9	69.9	0	0.0	100.0	10	14.7	117.2	83	80	3	3.6	71	68.2
OG33124C95 Excavation Effects Test in the ESF	7	7	9	10.3	10.3	13.2	0	0.0	100.0	-2	-28.6	77.8	68	68	0	0.0	87	103.4
OG33124D95 Intact Fractures Test, ESF	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	50	50	0	0.0	0.0	100.0

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OG33124D96 Intact Fractures Test, ESF	244	244	226	59.5	59.5	55.1	0	0.0	100.0	18	7.4	108.0	410	409	1	0.2	380	90.7
OG33124E95 Air-K & Hydrochemistry Testing-North Ramp Equip	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	40	40	0	0.0	0.0	100.0
OG33124E97 Air-K & Hydrochemistry Testing-North Ramp Alcoves	389	389	203	67.0	67.0	34.9	0	0.0	100.0	186	47.8	191.6	581	480	101	17.4	303	69.3
OG33126 Gaseous-Phase Movement in the Unsaturated Zone	195	178	199	67.5	61.6	68.9	-17	-8.7	91.3	-21	-11.8	89.4	289	289	0	0.0	323	123.3
OG33126A95 Gas Phase Circulation Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	8	8	0	0.0	0.0	100.0
OG33126A96 North Ramp, ESF Gas Phase Circulation	195	178	199	69.4	63.3	70.8	-17	-8.7	91.3	-21	-11.8	89.4	281	281	0	0.0	314	125.6
OG33127 Unsaturated Zone Hydrochemistry	478	478	367	47.6	47.6	36.5	0	0.0	100.0	111	23.2	130.2	1005	954	51	5.1	772	89.8
OG33127A95 UZ Hydrochemistry Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	80	80	0	0.0	0.0	100.0
OG33127A96 UZ Hydrochemistry	478	478	367	52.8	52.8	40.6	0	0.0	100.0	111	23.2	130.2	905	854	51	5.6	695	87.7
OG33127B95 UZ Hydrochemistry Equipment	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	20	20	0	0.0	0.0	100.0
OG33128 Fluid Flow in Unsaturated Zone Fractured Rock	112	110	92	60.5	59.5	49.7	-2	-1.8	98.2	18	16.4	119.6	185	185	0	0.0	155	80.6

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0G33128A95 Fluid Flow in UZ Fractured Rock	112	110	92	60.5	59.5	49.7	-2	-1.8	98.2	18	16.4	119.6	185	185	0	0.0	155	80.6
0G33129 Site Unsaturated Zone Modeling and Synthesis	150	150	133	60.0	60.0	53.2	0	0.0	100.0	17	11.3	112.8	250	251	-1	-0.4	222	84.7
0G33129A96 Intermediate Site UZ Flow Model	150	150	133	60.0	60.0	53.2	0	0.0	100.0	17	11.3	112.8	250	251	-1	-0.4	222	84.7
0G33131 Site Saturated Zone Ground-Water Flow System	717	717	649	59.8	59.8	54.1	0	0.0	100.0	68	9.5	110.5	1200	1325	-125	-10.4	1086	71.4
0G33131A97 Conduct Hydraulic/Tracer Test C-Holes	400	400	291	63.3	63.3	46.0	0	0.0	100.0	109	27.3	137.5	632	659	-27	-4.3	460	63.0
0G33131B97 Prelim Report for TSS on C-Wells Data	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	53	53	0	0.0	0.0	100.0
0G33131C97 Site Potentiometric Levels Monitoring	257	257	302	63.8	63.8	74.9	0	0.0	100.0	-45	-17.5	85.1	403	503	-100	-24.8	474	72.6
0G33131E95 Pumping & Testing Existing Monitoring Wells Equip	20	20	20	100.0	100.0	100.0	0	0.0	100.0	0	0.0	100.0	20	20	0	0.0	20	0.0
0G33131E96 Pumping and Testing Existing Monitoring Wells	40	40	36	43.5	43.5	39.1	0	0.0	100.0	4	10.0	111.1	92	90	2	2.2	83	96.3
0G33132 Saturated Zone Hydrochemistry	203	197	181	44.6	43.3	39.8	-6	-3.0	97.0	16	8.1	108.8	455	430	25	5.5	418	103.6

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0G33132A96 SZ Hydrochemistry Data Summary	79	79	51	56.4	56.4	36.4	0	0.0	100.0	28	35.4	154.9	140	110	30	21.4	90	103.4
0G33132B96 Death Valley SZ Hydrochemistry	33	17	27	58.9	30.4	48.2	-16	-48.5	51.5	-10	-58.8	63.0	56	59	-3	-5.4	89	121.9
0G33132C95 SZ Hydrochemistry Equipment	10	20	21	50.0	100.0	105.0	10	100.0	200.0	-1	-5.0	95.2	20	21	-1	-5.0	21	0.0
0G33132C96 SZ Hydrochemistry Equipment Procurement	81	81	82	39.7	39.7	40.2	0	0.0	100.0	-1	-1.2	98.8	204	205	-1	-0.5	206	100.0
0G33132D95 SZ Hydrochemistry Equipment Procurement	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	35	35	0	0.0	0.0	100.0
0G33133 Saturated Zone Hydro. Sys. Synthesis and Modeling	365	367	297	63.7	64.0	51.8	2	0.5	100.5	70	19.1	123.6	573	591	-18	-3.1	464	70.1
0G33133A96 Site SZ Flow Model Framework	180	180	192	60.6	60.6	64.6	0	0.0	100.0	-12	-6.7	93.8	297	302	-5	-1.7	317	106.4
0G33133B96 Site 3-D SZ Model	137	142	91	60.1	62.3	39.9	5	3.6	103.6	51	35.9	156.0	228	243	-15	-6.6	146	56.6
0G33133C95 Site SZ Conceptual Model Report	48	45	14	100.0	93.8	29.2	-3	-6.3	93.8	31	68.9	321.4	48	46	2	4.2	15	9.4
0G36211 Modern Regional Climate	27	27	24	60.0	60.0	53.3	0	0.0	100.0	3	11.1	112.5	45	40	5	11.1	40	112.5
0G36211B96 Isotopic Analysis of Modern Precipitation	27	27	24	60.0	60.0	53.3	0	0.0	100.0	3	11.1	112.5	45	40	5	11.1	40	112.5

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0G36212 Paleoclim. Study of Lake, Playa & Marsh Deposits	233	210	141	58.3	52.5	35.3	-23	-9.9	90.1	69	32.9	148.9	400	400	0	0.0	269	73.4
0G36212A96 Ostracodes, C-14, & Stable Isotopic Data from Core	233	210	141	58.3	52.5	35.3	-23	-9.9	90.1	69	32.9	148.9	400	400	0	0.0	269	73.4
0G36213 Climatic Implications of Terrestrial Paleoecology	85	85	0	42.5	42.5	0.0	0	0.0	100.0	85	100.0	0.0	200	154	46	23.0	0.0	74.7
0G36213A96 Packrat Middens & Pollen Studies	85	85	0	42.5	42.5	0.0	0	0.0	100.0	85	100.0	0.0	200	154	46	23.0	0.0	74.7
0G36214 Paleoenvironmental History of Yucca Mountain	384	384	355	42.2	42.2	39.0	0	0.0	100.0	29	7.6	108.2	910	647	263	28.9	841	180.1
0G36214A95 Document Erosion at Jake Ridge	10	10	7	100.0	100.0	70.0	0	0.0	100.0	3	30.0	142.9	10	7	3	30.0	7	0.0
0G36214B95 Geochronological Studies of Surface Deposits	238	238	303	34.0	34.0	43.3	0	0.0	100.0	-65	-27.3	78.5	700	515	185	26.4	892	217.9
0G36214C96 Surficial Deposits Mapping	136	136	45	68.0	68.0	22.5	0	0.0	100.0	91	66.9	302.2	200	125	75	37.5	66	80.0
0G36215 Paleoclimate-Paleoenvironmental Analysis	67	58	36	74.4	64.4	40.0	-9	-13.4	86.6	22	37.9	161.1	90	90	0	0.0	56	59.3
0G36215A95 Paleoclimate/Environmental Synthesis Study Plan	29	20	17	100.0	69.0	58.6	-9	-31.0	69.0	3	15.0	117.6	29	29	0	0.0	25	75.0

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0G36215C95 Paleoclimate Synthesis	38	38	19	62.3	62.3	31.1	0	0.0	100.0	19	50.0	200.0	61	61	0	0.0	31	54.8
0G36221 Quaternary Regional Hydrology	525	525	332	72.9	72.9	46.1	0	0.0	100.0	193	36.8	158.1	720	733	-13	-1.8	455	48.6
0G36221A96 Formation of Silica Within Yucca Mountain	41	41	30	58.6	58.6	42.9	0	0.0	100.0	11	26.8	136.7	70	70	0	0.0	51	72.5
0G36221B96 Dating Calcite Vein Deposits	57	57	70	57.0	57.0	70.0	0	0.0	100.0	-13	-22.8	81.4	100	100	0	0.0	123	143.3
0G36221C95 Evaluation of Past Discharge Areas	45	45	78	75.0	75.0	130.0	0	0.0	100.0	-33	-73.3	57.7	60	90	-30	-50.0	104	125.0
0G36221D96 Soil Fluid/Gas Isotopic Chemistry	53	53	50	58.9	58.9	55.6	0	0.0	100.0	3	5.7	106.0	90	93	-3	-3.3	85	86.0
0G36221E95 Vein Filling Calcite & Opaline Silica Deposits	329	329	104	82.3	82.3	26.0	0	0.0	100.0	225	68.4	316.3	400	380	20	5.0	126	25.7
0G3721 Natural Resource Assessment	150	150	145	100.0	100.0	96.7	0	0.0	100.0	5	3.3	103.4	150	145	5	3.3	145	0.0
0G3721A95 Geochem Assessment of YM/Pot for Mineralization	125	125	117	100.0	100.0	93.6	0	0.0	100.0	8	6.4	106.8	125	117	8	6.4	117	0.0
0G3721B95 Assess Geothermal Energy Potential at YM	25	25	28	100.0	100.0	112.0	0	0.0	100.0	-3	-12.0	89.3	25	28	-3	-12.0	28	0.0
0G399 Study Plan Preparation, Coordination, and Review	27	27	27	54.0	54.0	54.0	0	0.0	100.0	0	0.0	100.0	50	52	-2	-4.0	50	92.0

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0G3999584 Study Plan Comment Resolution	27	27	27	54.0	54.0	54.0	0	0.0	100.0	0	0.0	100.0	50	52	-2	-4.0	50	92.0
0G511 Regulatory Coordination and Planning	16	16	1	53.3	53.3	3.3	0	0.0	100.0	15	93.8	1600.0	30	21	9	30.0	2	70.0
0G51195B Regulatory Coordination and Planning	16	16	1	53.3	53.3	3.3	0	0.0	100.0	15	93.8	1600.0	30	21	9	30.0	2	70.0
0G522 Site Characterization Program	317	317	168	56.8	56.8	30.1	0	0.0	100.0	149	47.0	188.7	558	450	108	19.4	296	85.5
0G52295B1 NRC/NWTRB/ACNW Interactions	114	114	51	57.6	57.6	25.8	0	0.0	100.0	63	55.3	223.5	198	150	48	24.2	89	84.8
0G52295B2 Site Characterization Program	136	136	101	57.9	57.9	43.0	0	0.0	100.0	35	25.7	134.7	235	200	35	14.9	174	100.0
0G52295B4 Semi-Annual Progress Report	33	33	4	50.0	50.0	6.1	0	0.0	100.0	29	87.9	825.0	66	50	16	24.2	8	71.7
0G52295B5 Issue Resolution	34	34	0	57.6	57.6	0.0	0	0.0	100.0	34	100.0	0.0	59	10	49	83.1	0.0	250.0
0G52295B6 Volcanic Hazards	0	0	12	0.0	0.0	0.0	0	0.0	0.0	-12	0.0	0.0	0	40	-40	0.0	0.0	0.0
0G535 Technical Data Base Input	338	338	270	58.3	58.3	46.6	0	0.0	100.0	68	20.1	125.2	580	600	-20	-3.4	463	73.3
0G535958 Technical Data Coordination	338	338	270	58.3	58.3	46.6	0	0.0	100.0	68	20.1	125.2	580	600	-20	-3.4	463	73.3
0G56 Site Suitability Evaluation	66	66	4	55.9	55.9	3.4	0	0.0	100.0	62	93.9	1650.0	118	93	25	21.2	7	58.4

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OG5695B Site Suitability Evaluation	66	66	4	55.9	55.9	3.4	0	0.0	100.0	62	93.9	1650.0	118	93	25	21.2	7	58.4
OG9121 Participant Technical Project Office (TPO) Mgmnt.	194	194	325	44.5	44.5	74.5	0	0.0	100.0	-131	-67.5	59.7	436	539	-103	-23.6	730	113.1
OG912195B Technical Project Office Management	194	194	325	44.5	44.5	74.5	0	0.0	100.0	-131	-67.5	59.7	436	539	-103	-23.6	730	113.1
OG922 Participant Project Control	317	317	242	48.4	48.4	36.9	0	0.0	100.0	75	23.7	131.0	655	621	34	5.2	500	89.2
OG92295B Participant Project Control	317	317	242	48.4	48.4	36.9	0	0.0	100.0	75	23.7	131.0	655	621	34	5.2	500	89.2
OGB1 Quality Assurance Coordination and Planning	188	188	154	58.8	58.8	48.1	0	0.0	100.0	34	18.1	122.1	320	311	9	2.8	262	84.1
OGB195Q Quality Assurance Coordination and Planning	188	188	154	58.8	58.8	48.1	0	0.0	100.0	34	18.1	122.1	320	311	9	2.8	262	84.1
OGB2 Quality Assurance Program Development	276	276	299	58.7	58.7	63.6	0	0.0	100.0	-23	-8.3	92.3	470	472	-2	-0.4	509	112.1
OGB295Q Quality Assurance Program Development	276	276	299	58.7	58.7	63.6	0	0.0	100.0	-23	-8.3	92.3	470	472	-2	-0.4	509	112.1
OGB31 Quality Assurance Verification - Audits	257	257	216	58.1	58.1	48.9	0	0.0	100.0	41	16.0	119.0	442	426	16	3.6	371	88.1

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OGB3195Q Quality Assurance Verification - Audits	257	257	216	58.1	58.1	48.9	0	0.0	100.0	41	16.0	119.0	442	426	16	3.6	371	88.1
OGB32 Quality Assurance Verification - Surveillance	138	138	137	58.0	58.0	57.6	0	0.0	100.0	1	0.7	100.7	238	238	0	0.0	236	99.0
OGB3295Q Quality Assurance Verification - Surveillances	138	138	137	58.0	58.0	57.6	0	0.0	100.0	1	0.7	100.7	238	238	0	0.0	236	99.0
OGB5 Quality Assurance - Quality Engineering	250	250	176	58.1	58.1	40.9	0	0.0	100.0	74	29.6	142.0	430	380	50	11.6	303	88.2
OGB595Q Quality Assurance - Quality Engineering	250	250	176	58.1	58.1	40.9	0	0.0	100.0	74	29.6	142.0	430	380	50	11.6	303	88.2
OGC22 Local Records Center Operation (LRC)	213	213	159	58.0	58.0	43.3	0	0.0	100.0	54	25.4	134.0	367	337	30	8.2	274	86.5
OGC2295B Local Records Center Operation	213	213	159	58.0	58.0	43.3	0	0.0	100.0	54	25.4	134.0	367	337	30	8.2	274	86.5
OGC23 Affected Organization Records Management Activity	95	95	63	58.3	58.3	38.7	0	0.0	100.0	32	33.7	150.8	163	163	0	0.0	108	68.0
OGC2395B Participant Records Management	95	95	63	58.3	58.3	38.7	0	0.0	100.0	32	33.7	150.8	163	163	0	0.0	108	68.0
OGD25 Occupational Safety and Health	59	59	58	57.8	57.8	56.9	0	0.0	100.0	1	1.7	101.7	102	106	-4	-3.9	100	89.6

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OGD2595B Occupational Safety and Health	59	59	58	57.8	57.8	56.9	0	0.0	100.0	1	1.7	101.7	102	106	-4	-3.9	100	89.6
OGD47 Water Resources	478	481	218	48.9	49.2	22.3	3	0.6	100.6	263	54.7	220.6	977	977	0	0.0	443	65.3
OGD4795B Regional Groundwater Quality Network	223	223	28	69.9	69.9	8.8	0	0.0	100.0	195	87.4	796.4	319	319	0	0.0	40	33.0
OGD4795C Regional Groundwater Quality Network	0	0	0	0.0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	225	225	0	0.0	0.0	100.0
OGD4795H Water Resources Monitoring	255	258	190	58.9	59.6	43.9	3	1.2	101.2	68	26.4	135.8	433	433	0	0.0	319	72.0
OGF23 Support/Personnel Services	1101	1101	1235	58.5	58.5	65.6	0	0.0	100.0	-134	-12.2	89.1	1883	2036	-153	-8.1	2113	97.6
OGF2395B1 Administrative Support	250	250	286	59.1	59.1	67.6	0	0.0	100.0	-36	-14.4	87.4	423	473	-50	-11.8	484	92.5
OGF2395B2 Space and Facilities	806	806	902	58.3	58.3	65.2	0	0.0	100.0	-96	-11.9	89.4	1383	1483	-100	-7.2	1547	99.3
OGF2395B3 Procurement and Property Management	45	45	47	58.4	58.4	61.0	0	0.0	100.0	-2	-4.4	95.7	77	80	-3	-3.9	80	97.0
OGF3 YMP Support for the Training Mission	173	173	116	58.2	58.2	39.1	0	0.0	100.0	57	32.9	149.1	297	277	20	6.7	199	77.0
OGF395B YMP Support of the Training Mission	173	173	116	58.2	58.2	39.1	0	0.0	100.0	57	32.9	149.1	297	277	20	6.7	199	77.0

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0G1695B	Project Change Control Board Suport	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.4
0G1695B1		0.0	0.0	1.3	2.9	4.6	2.1	13.4	0.0	0.0	0.0	0.0	0.0	24.3
1.2.1.6		0.0	0.0	1.3	2.9	4.6	2.1	13.8	0.0	0.0	0.0	0.0	0.0	24.7
*1.2.1.6		0.0	0.0	1.3	2.9	4.6	2.1	13.8	0.0	0.0	0.0	0.0	0.0	24.7
0G1A95B	Q-List Development and Maintenance	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
1.2.1.10		0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
*1.2.1.1		0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7
**1.2.1		0.0	3.7	1.3	2.9	4.6	2.1	13.8	0.0	0.0	0.0	0.0	0.0	28.4
0G31295B1	ESI Science Advisory Group	1.6	0.5	0.3	1.5	36.6	26.3	12.1	0.0	0.0	0.0	0.0	0.0	78.9
0G31295B2	Nevada Operations	19.6	19.9	18.5	17.7	17.5	28.2	23.5	0.0	0.0	0.0	0.0	0.0	144.9
0G31295B3	Tracer Gas Support	0.0	31.4	-3.5	19.5	5.6	-6.7	9.1	0.0	0.0	0.0	0.0	0.0	55.4
0G31295B5	YMPB Computer Operations	25.6	27.3	31.1	40.7	29.8	40.3	39.0	0.0	0.0	0.0	0.0	0.0	233.8
0G31295B6	YMPB Scientific Rpts/Project Documents	14.8	7.0	19.5	17.4	17.6	15.9	25.5	0.0	0.0	0.0	0.0	0.0	117.7
0G31295B7	Earth Science Investigations (ESI)	47.9	33.3	47.2	46.5	44.9	53.5	58.4	0.0	0.0	0.0	0.0	0.0	331.7
0G31295B8	ESI QA Implementation	37.3	39.7	20.0	30.7	21.2	26.0	17.3	0.0	0.0	0.0	0.0	0.0	192.2
1.2.3.1.2		146.8	159.1	133.1	174.0	173.2	183.5	184.9	0.0	0.0	0.0	0.0	0.0	1154.6
*1.2.3.1		146.8	159.1	133.1	174.0	173.2	183.5	184.9	0.0	0.0	0.0	0.0	0.0	1154.6
0G32211B96	Update 3D models lithostrat/structural/r	26.1	23.7	31.4	65.2	26.1	24.8	25.9	0.0	0.0	0.0	0.0	0.0	223.2
0G32211C95	Results of Measured Sections in Site Are	18.6	21.5	22.2	-5.6	34.9	24.2	40.6	0.0	0.0	0.0	0.0	0.0	156.4
0G32211D95	Geophysics White Paper, Phase II	0.0	4.2	4.0	16.6	1.9	1.7	-3.1	0.0	0.0	0.0	0.0	0.0	25.3
0G32211E96	Regional Seismic Reflection Profiles	101.7	31.9	4.9	31.6	34.6	14.5	25.8	0.0	0.0	0.0	0.0	0.0	245.0
0G32211F96	Integration of Geology and Geophysics	1.1	-0.2	3.0	43.5	4.5	6.8	4.1	0.0	0.0	0.0	0.0	0.0	62.8
0G32211G96	Lithologic Logging of Core	20.9	12.3	13.1	25.7	30.5	10.8	41.6	0.0	0.0	0.0	0.0	0.0	154.9
0G32211H95	Magnetic Investigations - YM/Jet Ridge	0.0	0.0	0.0	0.0	0.0	14.5	10.7	0.0	0.0	0.0	0.0	0.0	25.2
0G32211J95	Magnetic/Gravity Investigations, at YM	0.0	0.0	0.0	18.2	2.0	2.3	7.2	0.0	0.0	0.0	0.0	0.0	29.7
0G32211K96	Mag Along Seismic Profile, Crater Flat,	0.0	0.6	0.0	20.2	6.2	2.4	-1.5	0.0	0.0	0.0	0.0	0.0	27.9
0G32211L96	Strat Desc of Bullfrog & Tram Tuffs	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6
0G32211M95	Lithology & Hydrologic Properties in the	1.7	7.7	11.7	10.3	-2.7	15.9	14.5	0.0	0.0	0.0	0.0	0.0	59.1
0G32211Q95	Mag/Grav Studies to Locate Volcanic Dril	0.0	1.4	0.0	11.3	10.6	13.0	4.5	0.0	0.0	0.0	0.0	0.0	40.8
1.2.3.2.2.1.1		170.1	103.1	90.3	237.0	148.6	130.9	170.9	0.0	0.0	0.0	0.0	0.0	1050.9
0G32212A95	Enhance Surface Geologic Maps	48.8	63.7	60.2	7.1	-8.5	36.2	25.3	0.0	0.0	0.0	0.0	0.0	232.8
0G32212B95	Geometry & Continuity of the Sundance Fa	5.8	0.2	1.4	67.5	28.6	75.8	41.7	0.0	0.0	0.0	0.0	0.0	221.0
0G32212C96	Expanded Surface Geology Mapping	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0G32212D96	Mapping in the ESF	55.8	95.6	70.2	20.2	277.7	237.5	238.9	0.0	0.0	0.0	0.0	0.0	995.9
0G32212E95	Vert Continuity of Fracture/Char-Paintbr	8.3	2.8	9.1	-16.0	9.8	18.0	31.7	0.0	0.0	0.0	0.0	0.0	63.7
0G32212F95	Pavement Mapping At Fran Ridge	1.1	3.2	1.3	15.9	2.3	6.3	9.7	0.0	0.0	0.0	0.0	0.0	39.8
0G32212G96	Verif & Enhance Scott & Bonk-Jet Ridge/M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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1.2.3.2.2.1.2	119.8	165.5	142.2	94.7	309.9	373.8	347.3	0.0	0.0	0.0	0.0	0.0	1553.2
0G3252A95 Structural Controls on Basaltic Volcanis	3.6	-0.4	6.0	13.6	-2.2	7.8	6.3	0.0	0.0	0.0	0.0	0.0	34.7
0G3252C95 Tectonic Effects on YM Hydrologic System	0.0	0.0	0.0	0.0	18.0	21.3	5.2	0.0	0.0	0.0	0.0	0.0	44.5
1.2.3.2.5.2	3.6	-0.4	6.0	13.6	15.8	29.1	11.5	0.0	0.0	0.0	0.0	0.0	79.2
0G32623A95 Technical Support for Soil and Rock	0.0	0.1	0.7	1.9	3.5	-0.5	0.1	0.0	0.0	0.0	0.0	0.0	5.8
1.2.3.2.6.2.3	0.0	0.1	0.7	1.9	3.5	-0.5	0.1	0.0	0.0	0.0	0.0	0.0	5.8
0G32722A96 Collect/Interpret Heat Flow Data	0.0	0.1	0.8	0.0	27.7	40.5	4.1	0.0	0.0	0.0	0.0	0.0	73.2
1.2.3.2.7.2.2	0.0	0.1	0.8	0.0	27.7	40.5	4.1	0.0	0.0	0.0	0.0	0.0	73.2
0G32831A95 Synthesis of Geol/Geophys/Seismic Data	5.7	11.4	-1.1	10.2	20.3	30.8	13.8	0.0	0.0	0.0	0.0	0.0	91.1
1.2.3.2.8.3.1	5.7	11.4	-1.1	10.2	20.3	30.8	13.8	0.0	0.0	0.0	0.0	0.0	91.1
0G32833A95 Ground Motion Attenuation	0.0	0.0	0.0	52.6	10.8	28.8	17.8	0.0	0.0	0.0	0.0	0.0	110.0
0G32833B96 Ground Motion Modeling	0.0	0.0	0.0	8.2	33.1	134.6	2.8	0.0	0.0	0.0	0.0	0.0	178.7
1.2.3.2.8.3.3	0.0	0.0	0.0	60.8	43.9	163.4	20.6	0.0	0.0	0.0	0.0	0.0	288.7
0G32836A95 GM Char in Prob. Seismic Hazard Analysis	2.0	-0.3	0.0	-1.7	6.1	1.2	3.5	0.0	0.0	0.0	0.0	0.0	10.8
0G32836B95 Probalistic Seismic Hazard Analysis	6.9	4.4	23.6	20.4	-20.5	6.8	0.7	0.0	0.0	0.0	0.0	0.0	42.3
1.2.3.2.8.3.6	8.9	4.1	23.6	18.7	-14.4	8.0	4.2	0.0	0.0	0.0	0.0	0.0	53.1
0G32841A95 Catalog of Seismic Activity	116.0	10.9	22.4	63.9	61.1	51.7	49.4	0.0	0.0	0.0	0.0	0.0	375.4
0G32841B95 Excavation Induced Seismic Activity	0.0	9.1	20.5	2.7	2.4	1.5	1.5	0.0	0.0	0.0	0.0	0.0	37.7
0G32841C96 Digital Upgrade SGB Seismic Network	0.0	68.0	20.5	36.6	35.8	38.4	68.2	0.0	0.0	0.0	0.0	0.0	267.5
0G32841D95 Precarious Rock Methodology	0.0	0.0	20.5	4.6	4.3	7.1	8.9	0.0	0.0	0.0	0.0	0.0	45.4
0G32841E95 Strong Motion Array	0.0	22.7	20.5	6.2	5.1	9.2	4.9	0.0	0.0	0.0	0.0	0.0	68.6
1.2.3.2.8.4.1	116.0	110.7	104.4	114.0	108.7	107.9	132.9	0.0	0.0	0.0	0.0	0.0	794.6
0G32843A95 Quaternary Faulting - Amargosa Desert	0.0	0.0	0.0	24.2	24.2	-0.2	1.0	0.0	0.0	0.0	0.0	0.0	49.2
0G32843B95 Quaternary Faulting - Regional Faults	0.0	0.0	0.0	42.0	12.5	26.8	11.6	0.0	0.0	0.0	0.0	0.0	92.9
0G32843C95 Quaternary Flting - Bare Mtn Fault Zone	8.6	8.0	3.3	7.6	3.0	28.0	30.4	0.0	0.0	0.0	0.0	0.0	88.9
0G32843D95 Char Death Valley-Furnace Creek Flt. Zon	0.0	42.9	7.9	29.2	15.5	23.9	22.5	0.0	0.0	0.0	0.0	0.0	141.9
1.2.3.2.8.4.3	8.6	50.9	11.2	103.0	55.2	78.5	65.5	0.0	0.0	0.0	0.0	0.0	372.9
0G32844A95 Quaternary Fltling Rock Valley Flt Sys	0.0	0.6	10.1	13.2	17.0	29.1	18.0	0.0	0.0	0.0	0.0	0.0	88.0
0G32844B95 Quaternary Flting - Mine Mtn Flt System	0.0	0.0	0.0	0.0	4.9	-0.1	10.0	0.0	0.0	0.0	0.0	0.0	14.8
0G32844C95 Quaternary Flting - Cane Springs Flt Sys	3.3	2.7	-6.0	0.0	9.5	1.1	4.0	0.0	0.0	0.0	0.0	0.0	14.6
1.2.3.2.8.4.4	3.3	3.3	4.1	13.2	31.4	30.1	32.0	0.0	0.0	0.0	0.0	0.0	117.4
0G32845A95 Detachment Faults	5.8	14.5	46.3	-21.8	19.3	23.0	29.3	0.0	0.0	0.0	0.0	0.0	116.4
1.2.3.2.8.4.5	5.8	14.5	46.3	-21.8	19.3	23.0	29.3	0.0	0.0	0.0	0.0	0.0	116.4
0G32846A95 Quat Flting-Solitario Cyn/Crater Flt/Win	11.0	7.0	18.4	-3.7	25.8	14.5	15.0	0.0	0.0	0.0	0.0	0.0	88.0
0G32846B95 Quaternary Flting - Ghost Dance Flt	2.4	6.9	9.9	2.4	8.2	21.5	17.6	0.0	0.0	0.0	0.0	0.0	68.9
0G32846C95 Quaternary Flting - Post Fortymile Wash	0.0	0.5	0.0	0.0	3.1	1.2	10.3	0.0	0.0	0.0	0.0	0.0	15.1
0G32846D95 Quat Flting-Bow Ridge/Paintbrush Cyn/Sta	8.9	10.8	14.0	13.6	19.8	20.1	4.8	0.0	0.0	0.0	0.0	0.0	92.0

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1.2.3.2.8.4.6	22.3	25.2	42.3	12.3	56.9	57.3	47.7	0.0	0.0	0.0	0.0	0.0	264.0
0G32848A95 In-situ Stress Measurements	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
1.2.3.2.8.4.8	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
0G3284AA95 Geodetic Leveling	0.0	0.0	0.0	17.0	-6.4	22.0	0.0	0.0	0.0	0.0	0.0	0.0	32.6
0G3284AB95 Death Valley/Furnace Creek Leveling	0.0	0.0	0.0	5.4	9.4	6.8	0.0	0.0	0.0	0.0	0.0	0.0	21.6
1.2.3.2.8.4.10	0.0	0.0	0.0	22.4	3.0	28.8	0.0	0.0	0.0	0.0	0.0	0.0	54.2
0G3284CA96 Tectonic Models and Synthesis	4.4	40.0	7.8	-12.5	27.8	21.0	3.1	0.0	0.0	0.0	0.0	0.0	91.6
1.2.3.2.8.4.12	4.4	40.0	7.8	-12.5	27.8	21.0	3.1	0.0	0.0	0.0	0.0	0.0	91.6
*1.2.3.2	468.5	528.5	478.6	667.5	860.7	1122.6	883.0	0.0	0.0	0.0	0.0	0.0	5009.4
0G33111A96 Char of the Meteorology for Regional Hyd	11.3	8.5	11.9	8.4	6.3	11.8	6.9	0.0	0.0	0.0	0.0	0.0	65.1
1.2.3.3.1.1.1	11.3	8.5	11.9	8.4	6.3	11.8	6.9	0.0	0.0	0.0	0.0	0.0	65.1
0G33112A95 Streamflow Data, FY94	5.5	5.5	8.1	13.5	4.8	10.6	16.7	0.0	0.0	0.0	0.0	0.0	64.7
0G33112B96 Streamflow Data, FY95	21.7	23.5	26.2	25.2	28.6	21.3	19.9	0.0	0.0	0.0	0.0	0.0	166.4
1.2.3.3.1.1.2	27.2	29.0	34.3	38.7	33.4	31.9	36.6	0.0	0.0	0.0	0.0	0.0	231.1
0G33113A95 Assessment of Key Data/Modeling Problems	4.3	4.6	2.4	5.9	15.0	5.9	4.8	0.0	0.0	0.0	0.0	0.0	42.9
0G33113C95 Fortymile Wash Recharge	5.5	5.4	6.0	7.2	5.5	5.8	7.2	0.0	0.0	0.0	0.0	0.0	42.6
1.2.3.3.1.1.3	9.8	10.0	8.4	13.1	20.5	11.7	12.0	0.0	0.0	0.0	0.0	0.0	85.5
0G33114A96 Regional SZ Numerical Flow Model	7.0	17.8	5.3	-6.5	15.6	2.3	3.9	0.0	0.0	0.0	0.0	0.0	45.4
0G33114B96 SZ Flow Model Boundary Conditions Evalua	0.0	0.2	0.6	0.8	3.6	3.8	3.0	0.0	0.0	0.0	0.0	0.0	12.0
0G33114C96 Regional SZ Hydrogeologic Framework Mode	0.0	0.0	0.0	0.0	1.5	7.0	10.7	0.0	0.0	0.0	0.0	0.0	19.2
1.2.3.3.1.1.4	7.0	18.0	5.9	-5.7	20.7	13.1	17.6	0.0	0.0	0.0	0.0	0.0	76.6
0G33121A96 Infiltration Properties	35.0	50.0	58.8	33.6	49.4	49.0	52.8	0.0	0.0	0.0	0.0	0.0	328.6
0G33121B96 Infiltration Processes	26.3	30.5	40.3	28.8	49.6	29.0	36.1	0.0	0.0	0.0	0.0	0.0	240.6
0G33121C95 Infiltration Distribution	22.5	15.2	19.7	31.2	19.8	24.1	20.3	0.0	0.0	0.0	0.0	0.0	152.8
1.2.3.3.1.2.1	83.8	95.7	118.8	93.6	118.8	102.1	109.2	0.0	0.0	0.0	0.0	0.0	722.0
0G33123A96 Matrix Properties of Hydrogeologic Units	29.7	26.2	30.5	37.3	33.2	39.8	29.0	0.0	0.0	0.0	0.0	0.0	225.7
0G33123B95 Surface-Based Air-Permeability Testing	23.5	20.4	27.9	22.5	168.1	24.7	38.2	0.0	0.0	0.0	0.0	0.0	325.3
0G33123C95 Vertical Seismic Profiling Test	14.3	9.8	2.6	9.4	73.0	18.3	46.4	0.0	0.0	0.0	0.0	0.0	173.8
0G33123D95 Drilling & Drillhole Instrumentation	102.1	76.5	40.4	46.4	30.6	66.4	23.7	0.0	0.0	0.0	0.0	0.0	386.1
0G33123E95 Sensor Calibration & In-Situ Testing	33.6	41.7	38.6	42.7	42.3	36.8	32.2	0.0	0.0	0.0	0.0	0.0	267.9
0G33123F95 UZ Monit, DataBase Mgnt, QA Support, & C	24.4	25.1	23.9	30.4	23.3	36.4	23.8	0.0	0.0	0.0	0.0	0.0	187.3
0G33123G95 Integrated Data Analysis and Interpretat	0.0	1.0	7.5	-2.6	5.5	3.8	17.2	0.0	0.0	0.0	0.0	0.0	32.4
1.2.3.3.1.2.3	227.6	200.7	171.4	186.1	376.0	226.2	210.5	0.0	0.0	0.0	0.0	0.0	1598.5
0G33124A96 North Ramp Perched Water Testing	6.0	6.5	6.6	6.9	6.0	10.8	6.7	0.0	0.0	0.0	0.0	0.0	49.5
0G33124B95 Percolation Test in the ESF	6.0	11.2	10.6	7.3	7.4	7.2	6.1	0.0	0.0	0.0	0.0	0.0	55.8
0G33124C95 Excavation Effects Test in the ESF	6.3	2.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
0G33124D96 Intact Fractures Test, ESF	22.1	50.7	29.0	32.2	22.9	35.6	29.3	0.0	0.0	0.0	0.0	0.0	221.8

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0G33124E97 Air-K & Hydrochemistry Testing-North Ram	16.4	20.8	23.6	24.4	36.0	64.2	15.3	0.0	0.0	0.0	0.0	0.0	200.7
1.2.3.3.1.2.4	56.8	91.2	70.5	70.8	72.3	117.8	57.4	0.0	0.0	0.0	0.0	0.0	536.8
0G33126A96 North Ramp, ESF Gas Phase Circulation	20.2	17.5	24.3	50.1	43.1	24.1	20.5	0.0	0.0	0.0	0.0	0.0	199.8
1.2.3.3.1.2.6	20.2	17.5	24.3	50.1	43.1	24.1	20.5	0.0	0.0	0.0	0.0	0.0	199.8
0G33127A96 UZ Hydrochemistry	71.7	69.8	71.6	-24.6	43.9	59.1	78.1	0.0	0.0	0.0	0.0	0.0	369.6
1.2.3.3.1.2.7	71.7	69.8	71.6	-24.6	43.9	59.1	78.1	0.0	0.0	0.0	0.0	0.0	369.6
0G33128A95 Fluid Flow in UZ Fractured Rock	6.5	3.5	11.7	8.8	10.5	11.2	39.5	0.0	0.0	0.0	0.0	0.0	91.7
1.2.3.3.1.2.8	6.5	3.5	11.7	8.8	10.5	11.2	39.5	0.0	0.0	0.0	0.0	0.0	91.7
0G33129A96 Intermediate Site UZ Flow Model	15.2	16.8	21.2	20.3	14.2	22.2	25.1	0.0	0.0	0.0	0.0	0.0	135.0
1.2.3.3.1.2.9	15.2	16.8	21.2	20.3	14.2	22.2	25.1	0.0	0.0	0.0	0.0	0.0	135.0
0G33131A97 Conduct Hydraulic/Tracer Test C-Holes	23.2	47.4	47.5	35.2	29.3	45.2	61.6	0.0	0.0	0.0	0.0	0.0	289.4
0G33131B97 Prelim Report for TSS on C-Wells Data	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0G33131C97 Site Potentiometric Levels Monitoring	28.6	42.6	84.4	44.3	25.1	41.9	32.1	0.0	0.0	0.0	0.0	0.0	299.0
0G33131E96 Pumping and Testing Existing Monitoring	0.0	1.3	-0.7	0.6	13.0	15.6	5.7	0.0	0.0	0.0	0.0	0.0	35.5
1.2.3.3.1.3.1	51.8	91.3	131.2	80.1	67.4	102.7	99.4	0.0	0.0	0.0	0.0	0.0	623.9
0G33132A96 SZ Hydrochemistry Data Summary	2.3	2.8	6.5	2.7	1.5	5.0	30.6	0.0	0.0	0.0	0.0	0.0	51.4
0G33132B96 Death Valley SZ Hydrochemistry	3.8	1.2	3.9	1.0	4.0	5.0	8.5	0.0	0.0	0.0	0.0	0.0	27.4
0G33132C96 SZ Hydrochemistry Equipment Procurement	0.0	29.2	34.0	0.9	0.8	1.2	16.2	0.0	0.0	0.0	0.0	0.0	82.3
1.2.3.3.1.3.2	6.1	33.2	44.4	4.6	6.3	11.2	55.3	0.0	0.0	0.0	0.0	0.0	161.1
0G33133A96 Site SZ Flow Model Framework	16.7	32.0	43.8	4.5	51.9	33.4	10.0	0.0	0.0	0.0	0.0	0.0	192.3
0G33133B96 Site 3-D SZ Model	5.7	13.1	11.9	7.8	14.4	18.7	19.0	0.0	0.0	0.0	0.0	0.0	90.6
0G33133C95 Site SZ Conceptual Model Report	0.4	1.9	3.5	5.6	4.2	0.0	-2.3	0.0	0.0	0.0	0.0	0.0	13.3
1.2.3.3.1.3.3	22.8	47.0	59.2	17.9	70.5	52.1	26.7	0.0	0.0	0.0	0.0	0.0	296.2
*1.2.3.3	617.8	732.2	784.8	562.2	903.9	797.2	794.8	0.0	0.0	0.0	0.0	0.0	5192.9
0G36211B96 Isotopic Analysis of Modern Precipitatio	0.6	1.4	0.1	1.8	-0.4	9.6	9.7	0.0	0.0	0.0	0.0	0.0	22.8
1.2.3.6.2.1.1	0.6	1.4	0.1	1.8	-0.4	9.6	9.7	0.0	0.0	0.0	0.0	0.0	22.8
0G36212A96 Ostracodes, C-14, & Stable Isotopic Data	9.3	6.9	27.1	15.3	13.4	30.4	36.3	0.0	0.0	0.0	0.0	0.0	138.7
1.2.3.6.2.1.2	9.3	6.9	27.1	15.3	13.4	30.4	36.3	0.0	0.0	0.0	0.0	0.0	138.7
0G36213A96 Packrat Middens & Pollen Studies	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5
1.2.3.6.2.1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5
0G36214A95 Document Erosion at Jake Ridge	0.0	0.0	0.0	3.7	0.8	1.0	0.5	0.0	0.0	0.0	0.0	0.0	6.0
0G36214B95 Geochronological Studies of Surface Depo	9.5	7.4	12.2	85.1	90.8	57.5	41.1	0.0	0.0	0.0	0.0	0.0	303.6
0G36214C96 Surficial Deposits Mapping	5.4	4.8	10.8	7.4	5.5	4.8	5.9	0.0	0.0	0.0	0.0	0.0	44.6
1.2.3.6.2.1.4	14.9	12.2	23.0	96.2	97.1	63.3	47.5	0.0	0.0	0.0	0.0	0.0	354.2
0G36215A95 Paleoclimate/Environmental Synthesis Stu	3.9	6.6	3.1	3.5	2.9	1.2	-4.1	0.0	0.0	0.0	0.0	0.0	17.1
0G36215C95 Paleoclimate Synthesis	0.0	0.1	0.0	6.6	5.8	6.2	0.0	0.0	0.0	0.0	0.0	0.0	18.7
1.2.3.6.2.1.5	3.9	6.7	3.1	10.1	8.7	7.4	-4.1	0.0	0.0	0.0	0.0	0.0	35.8

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0G36221A96	Formation of Silica Within Yucca Mountai	2.4	3.6	8.5	0.1	5.2	-15.9	26.0	0.0	0.0	0.0	0.0	0.0	29.9
0G36221B96	Dating Calcite Vein Deposits	0.3	8.8	14.3	8.9	25.9	9.4	2.0	0.0	0.0	0.0	0.0	0.0	69.6
0G36221C95	Evaluation of Past Discharge Areas	1.9	3.1	10.9	5.7	26.7	14.4	12.2	0.0	0.0	0.0	0.0	0.0	74.9
0G36221D96	Soil Fluid/Gas Isotopic Chemistry	5.9	4.0	13.6	8.3	11.3	-2.6	11.0	0.0	0.0	0.0	0.0	0.0	51.5
0G36221E95	Vein Filling Calcite & Opaline Silica De	12.6	7.8	7.9	7.3	24.2	5.8	40.7	0.0	0.0	0.0	0.0	0.0	106.3
1.2.3.6.2.2.1		23.1	27.3	55.2	30.3	93.3	11.1	91.9	0.0	0.0	0.0	0.0	0.0	332.2
*1.2.3.6		51.8	54.5	108.5	153.7	212.1	121.8	181.8	0.0	0.0	0.0	0.0	0.0	884.2
0G3721A95	Geochem Assessment of YM/Pot for Mineral	12.6	20.6	21.4	11.1	27.1	21.5	2.2	0.0	0.0	0.0	0.0	0.0	116.5
0G3721B95	Assess Geothermal Energy Potential at YM	0.0	0.6	0.0	7.7	18.2	0.7	0.4	0.0	0.0	0.0	0.0	0.0	27.6
1.2.3.7.2.1		12.6	21.2	21.4	18.8	45.3	22.2	2.6	0.0	0.0	0.0	0.0	0.0	144.1
*1.2.3.7		12.6	21.2	21.4	18.8	45.3	22.2	2.6	0.0	0.0	0.0	0.0	0.0	144.1
0G39995B4	Study Plan Comment Resolution	0.0	7.0	2.4	7.9	5.2	0.0	5.1	0.0	0.0	0.0	0.0	0.0	27.6
1.2.3.9.9		0.0	7.0	2.4	7.9	5.2	0.0	5.1	0.0	0.0	0.0	0.0	0.0	27.6
*1.2.3.9		0.0	7.0	2.4	7.9	5.2	0.0	5.1	0.0	0.0	0.0	0.0	0.0	27.6
**1.2.3		1297.5	1502.5	1528.8	1584.1	2200.4	2247.3	2052.2	0.0	0.0	0.0	0.0	0.0	12412.8
0G51195B	Regulatory Coordination and Planning	0.8	0.0	0.0	0.0	0.0	8.7	-9.3	0.0	0.0	0.0	0.0	0.0	0.2
1.2.5.1.1		0.8	0.0	0.0	0.0	0.0	8.7	-9.3	0.0	0.0	0.0	0.0	0.0	0.2
*1.2.5.1		0.8	0.0	0.0	0.0	0.0	8.7	-9.3	0.0	0.0	0.0	0.0	0.0	0.2
0G52295B1	NRC/NWTRB/ACNW Interactions	4.5	20.0	-6.8	8.4	13.5	6.9	2.7	0.0	0.0	0.0	0.0	0.0	49.2
0G52295B2	Site Characterization Program	22.5	22.4	29.3	34.2	-26.7	7.3	13.1	0.0	0.0	0.0	0.0	0.0	102.1
0G52295B4	Semi-Annual Progress Report	0.0	1.4	-1.4	0.3	0.0	8.5	-5.0	0.0	0.0	0.0	0.0	0.0	3.8
0G52295B5	Issue Resolution	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
0G52295B6		0.0	0.0	0.0	0.0	0.0	6.9	4.8	0.0	0.0	0.0	0.0	0.0	11.7
1.2.5.2.2		27.0	43.8	21.4	42.9	-13.2	29.6	15.6	0.0	0.0	0.0	0.0	0.0	167.1
*1.2.5.2		27.0	43.8	21.4	42.9	-13.2	29.6	15.6	0.0	0.0	0.0	0.0	0.0	167.1
0G53595B	Technical Data Coordination	31.9	28.5	28.2	33.9	32.0	79.8	35.2	0.0	0.0	0.0	0.0	0.0	269.5
1.2.5.3.5		31.9	28.5	28.2	33.9	32.0	79.8	35.2	0.0	0.0	0.0	0.0	0.0	269.5
*1.2.5.3		31.9	28.5	28.2	33.9	32.0	79.8	35.2	0.0	0.0	0.0	0.0	0.0	269.5
0G5695B	Site Suitability Evaluation	2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4
1.2.5.6		2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4
*1.2.5.6		2.9	0.8	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4
**1.2.5		62.6	73.1	49.9	76.8	19.2	118.1	41.5	0.0	0.0	0.0	0.0	0.0	441.2
0G9121 95B	Technical Project Office Management	38.4	42.7	54.3	50.6	28.8	79.3	32.1	0.0	0.0	0.0	0.0	0.0	326.2
1.2.9.1.2.1		38.4	42.7	54.3	50.6	28.8	79.3	32.1	0.0	0.0	0.0	0.0	0.0	326.2
*1.2.9.1		38.4	42.7	54.3	50.6	28.8	79.3	32.1	0.0	0.0	0.0	0.0	0.0	326.2
0G92295B	Participant Project Control	29.2	30.6	28.6	31.4	42.0	38.7	41.8	0.0	0.0	0.0	0.0	0.0	242.3
1.2.9.2.2		29.2	30.6	28.6	31.4	42.0	38.7	41.8	0.0	0.0	0.0	0.0	0.0	242.3

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*1.2.9.2		29.2	30.6	28.6	31.4	42.0	38.7	41.8	0.0	0.0	0.0	0.0	0.0	242.3
**1.2.9		67.6	73.3	82.9	82.0	70.8	118.0	73.9	0.0	0.0	0.0	0.0	0.0	568.5
OGB195Q	Quality Assurance Coordination and Plann	20.9	16.7	20.2	20.8	22.2	27.7	22.6	0.0	0.0	0.0	0.0	0.0	151.1
1.2.11.1		20.9	16.7	20.2	20.8	22.2	27.7	22.6	0.0	0.0	0.0	0.0	0.0	151.1
*1.2.11.1		20.9	16.7	20.2	20.8	22.2	27.7	22.6	0.0	0.0	0.0	0.0	0.0	151.1
OGB295Q	Quality Assurance Program Development	49.6	46.9	48.5	52.7	35.7	33.6	30.0	0.0	0.0	0.0	0.0	0.0	297.0
1.2.11.2		49.6	46.9	48.5	52.7	35.7	33.6	30.0	0.0	0.0	0.0	0.0	0.0	297.0
*1.2.11.2		49.6	46.9	48.5	52.7	35.7	33.6	30.0	0.0	0.0	0.0	0.0	0.0	297.0
OGB3195Q	Quality Assurance Verification - Audits	33.6	17.1	38.2	16.7	12.8	37.8	59.3	0.0	0.0	0.0	0.0	0.0	215.5
1.2.11.3.1		33.6	17.1	38.2	16.7	12.8	37.8	59.3	0.0	0.0	0.0	0.0	0.0	215.5
OGB3295Q	Quality Assurance Verification - Surveil	8.8	30.1	26.5	16.7	23.2	20.3	11.0	0.0	0.0	0.0	0.0	0.0	136.6
1.2.11.3.2		8.8	30.1	26.5	16.7	23.2	20.3	11.0	0.0	0.0	0.0	0.0	0.0	136.6
*1.2.11.3		42.4	47.2	64.7	33.4	36.0	58.1	70.3	0.0	0.0	0.0	0.0	0.0	352.1
OGB595Q	Quality Assurance - Quality Engineering	2.2	8.7	21.0	23.1	31.2	63.7	26.1	0.0	0.0	0.0	0.0	0.0	176.0
1.2.11.5		2.2	8.7	21.0	23.1	31.2	63.7	26.1	0.0	0.0	0.0	0.0	0.0	176.0
*1.2.11.5		2.2	8.7	21.0	23.1	31.2	63.7	26.1	0.0	0.0	0.0	0.0	0.0	176.0
**1.2.11		115.1	119.5	154.4	130.0	125.1	183.1	149.0	0.0	0.0	0.0	0.0	0.0	976.2
OGC2295B	Local Records Center Operation	24.5	24.5	21.2	26.3	20.0	22.7	20.2	0.0	0.0	0.0	0.0	0.0	159.4
1.2.12.2.2		24.5	24.5	21.2	26.3	20.0	22.7	20.2	0.0	0.0	0.0	0.0	0.0	159.4
OGC2395B	Participant Records Management	6.8	9.5	10.5	9.9	8.9	6.0	9.5	0.0	0.0	0.0	0.0	0.0	61.1
1.2.12.2.3		6.8	9.5	10.5	9.9	8.9	6.0	9.5	0.0	0.0	0.0	0.0	0.0	61.1
*1.2.12.2		31.3	34.0	31.7	36.2	28.9	28.7	29.7	0.0	0.0	0.0	0.0	0.0	220.5
**1.2.12		31.3	34.0	31.7	36.2	28.9	28.7	29.7	0.0	0.0	0.0	0.0	0.0	220.5
OGD2595B	Occupational Safety and Health	6.7	8.2	5.1	13.1	8.7	8.5	6.5	0.0	0.0	0.0	0.0	0.0	56.8
1.2.13.2.5		6.7	8.2	5.1	13.1	8.7	8.5	6.5	0.0	0.0	0.0	0.0	0.0	56.8
*1.2.13.2		6.7	8.2	5.1	13.1	8.7	8.5	6.5	0.0	0.0	0.0	0.0	0.0	56.8
OGD4795B	Regional Groundwater Quality Network	0.0	3.1	2.7	4.4	3.9	6.1	7.5	0.0	0.0	0.0	0.0	0.0	27.7
OGD4795H	Water Resources Monitoring	35.2	31.8	49.1	34.3	35.0	29.5	-7.0	0.0	0.0	0.0	0.0	0.0	207.9
1.2.13.4.7		35.2	34.9	51.8	38.7	38.9	35.6	0.5	0.0	0.0	0.0	0.0	0.0	235.6
*1.2.13.4		35.2	34.9	51.8	38.7	38.9	35.6	0.5	0.0	0.0	0.0	0.0	0.0	235.6
**1.2.13		41.9	43.1	56.9	51.8	47.6	44.1	7.0	0.0	0.0	0.0	0.0	0.0	292.4
OGF2395B1	Administrative Support	27.1	36.2	45.2	42.2	36.2	56.5	42.8	0.0	0.0	0.0	0.0	0.0	286.2
OGF2395B2	Space and Facilities	100.6	84.0	117.2	230.8	153.5	95.4	118.5	0.0	0.0	0.0	0.0	0.0	900.0
OGF2395B3		0.0	9.9	5.9	9.5	6.4	7.5	5.8	0.0	0.0	0.0	0.0	0.0	45.0
1.2.15.2.3		127.7	130.1	168.3	282.5	196.1	159.4	167.1	0.0	0.0	0.0	0.0	0.0	1231.2
*1.2.15.2		127.7	130.1	168.3	282.5	196.1	159.4	167.1	0.0	0.0	0.0	0.0	0.0	1231.2
OGF395B	YMP Support of the Training Mission	10.2	17.7	16.3	16.9	16.8	18.9	19.1	0.0	0.0	0.0	0.0	0.0	115.9

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1.2.15.3	10.2	17.7	16.3	16.9	16.8	18.9	19.1	0.0	0.0	0.0	0.0	0.0	115.9
*1.2.15.3	10.2	17.7	16.3	16.9	16.8	18.9	19.1	0.0	0.0	0.0	0.0	0.0	115.9
**1.2.15	137.9	147.8	184.6	299.4	212.9	178.3	186.2	0.0	0.0	0.0	0.0	0.0	1347.1
1.2 OPERATING	1753.9	1997.0	2090.5	2263.2	2709.5	2919.7	2553.3	0.0	0.0	0.0	0.0	0.0	16287.1
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	39.2	11.9	20.8	0.0	0.0	0.0	0.0	0.0	71.9
GRAND TOTAL	1753.9	1997.0	2090.5	2263.2	2748.7	2931.6	2574.1	0.0	0.0	0.0	0.0	0.0	16359.0
FTEs													
FEDERAL	104.9	112.4	103.7	161.4	143.4	169.8	159.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	80.4	83.7	86.8	97.2	117.6	135.4	128.2	0.0	0.0	0.0	0.0	0.0	
TOTAL	185.3	196.1	190.5	258.6	261.0	305.2	287.2	0.0	0.0	0.0	0.0	0.0	

* Fourth level WBS roll-up
** Third level WBS roll-up