



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Yucca Mountain Site Characterization Office  
P.O. Box 30307  
North Las Vegas, NV 89036-0307

**OCT 06 1997**

**OVERNIGHT MAIL**

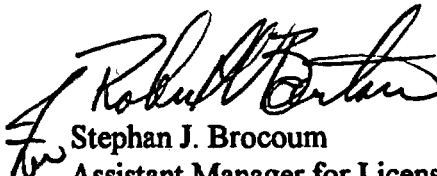
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Rockville, MD 20852

**SUBMITTAL OF PARTICIPANTS' MONTHLY PROGRESS REPORT**

As you have requested, the U.S. Nuclear Regulatory Commission is on distribution to receive a copy of the Yucca Mountain Site Characterization Project participants' monthly status report on a regular basis. Enclosed is the U.S. Geological Survey Progress Report for August 1997.

If you have any questions, please contact April V. Gil at (702) 794-5578.

AML:AVG-2456

  
Stephan J. Brocoun  
Assistant Manager for Licensing

Enclosure:

Ltr, 09/16/97, Craig to Kozai, w/encl

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OCT 06 1997

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IN REPLY REFER TO

Enclosure

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U.S. GEOLOGICAL SURVEY

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## INFORMATION ONLY

September 16, 1997

Wayne Kozai  
Yucca Mountain Site Characterization  
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U. S. Department of Energy  
P.O. Box 30307  
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**SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)  
Progress Report, August, 1997**

Attached is the USGS progress report in the required format for the month of August, 1997.

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

Sincerely,

for Robert W. Craig  
Technical Project Officer  
Yucca Mountain Project Branch  
U.S. Geological Survey

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**U. S. GEOLOGICAL SURVEY  
EXECUTIVE SUMMARY  
AUGUST 1997**

**WBS 1.2.3.1 Coordination and Planing**

U.S. Geological Survey - Yucca Mountain Project is currently processing 143 scientific papers prepared by USGS authors. Of these, 96 are related to geologic studies and 47 to hydrologic studies. In addition, 32 abstracts are being processed, as well as 17 reports by LANL personnel.

**WBS 1.2.3.2 Geology**

**Geologic Framework**

The 1:24,000-scale Site Area Geologic Map was completed (Level 3 Milestone SPG22M3) on August 19 and submitted to DOE; the electronic version of the map was submitted to the Technical Data Base. Project personnel also reviewed galley proofs of the 1:6,000-scale Bedrock Geologic Map of the Central Block Area that is being prepared as a USGS Miscellaneous Investigations Map.

The Level 4 Milestone report (SPG33M4) "Evaluation of the structural significance of bomb-pulse  $^{36}\text{Cl}$  at sample locations in the Exploratory Studies Facility, Yucca mountain, Nevada" was completed. This report, which is a joint effort between USGS and LANL scientists, presents a conceptual model to explain the distribution of bomb-pulse  $^{36}\text{Cl}$  in the ESF. The model asserts that the following factors are necessary conditions to allow for the arrival of a component of bomb-plus  $^{36}\text{Cl}$  at the level of the ESF:

- 1) A continuous fracture pathway must extend from the surface to the sampled depth. In general, the fracture networks of the Tiva Canyon and Topopah Spring welded units are adequate to provide continuous fracture flow through these units. The limiting lithologic units for sustaining fracture flow to depth are those equivalent to the PTn hydrogeologic unit. Thus, meeting this condition requires the presence of a fault that disrupts the PTn unit and provides a continuous fracture pathway through it.
- 2) The magnitude of surface infiltration must be sufficiently high to initiate and sustain at least a small component of fracture flow along the connected fracture path. In general, this condition requires alluvial depths of less than 3 m because, in relatively wet years, water can exceed the soil's storage capacity and allow saturated or near-saturated conditions to exist at the tuff/alluvium interface, thus initiating fracture flow. Soils deeper than 3 meters can generally store all infiltration in the root zone.
- 3) Travel time through the alluvial cover must be sufficiently rapid to allow infiltrating waters to reach the soil/bedrock interface in less than 50 years before being lost through evapotranspiration; in general, this condition is met whenever condition 2 is satisfied, i.e., if alluvial depths are less than 3 m.

The report emphasizes that the three principal controls on  $^{36}\text{Cl}$  distribution listed above cannot be analyzed independently, and that spatially distributed infiltration or soil thickness need to be taken into account in the modeling. For example, major faults that underlie large washes (where infiltration is expected to be low due to the storage capacity of the alluvium) are expected to have a completely different  $^{36}\text{Cl}$  signature at depth than faults that cross ridge tops (where surface infiltration may more easily penetrate to the bedrock). The model represented by the above three conditions may also not account adequately for enhanced infiltration due to channel runoff events, which may be relatively rare but nonetheless significant in the generation of fast pathways.

Correlation of geophysical log signatures from boreholes at Yucca Mountain continued. Fifty-one lithostratigraphic contacts are now being identified, an increase of seven over the forty-four previously reported upon. Work during the reporting period focused on extracting hard copies of the contacts in each borehole for comparison of consistent geophysical log expressions, as well as continuing the testing and revising of EXCEL-spreadsheet macros that are being designed to display segments of the suite of geophysical logs for documenting contact selection.

Project personnel completed their responses to reviewer comments on Sections 3.3.6 (Site Stratigraphy) and 3.3.7 (Site Structural Geology) for the PISA report, and prepared and submitted final digital versions of figures for these two sections.

A letter report (SPG42CM3) "Geology of the South Ramp, Station 55+00 to 78+77," was completed; included are full-periphery maps and detailed line survey data. Technical and acquired data reviews of full-periphery maps and detailed line survey data for the South Ramp and Northern Ghost Dance Fault Alcove were completed, and field checking and correction of maps and line surveys for the Southern Ghost Dance Fault Alcove continued. Project staff worked on various alignments and construction scenarios to provide the most expedient access to tuffs of the Calico Hills Formation from the end of the cross-block drift.

### Seismotectonic Studies

Project personnel completed an expanded table of faults parameters to describe all of the parameters pertinent to the potential repository at Yucca Mountain. Deterministic earthquakes were assessed for faults within five kilometers of the site, for the more distant Rock Valley and Furnace Creek faults, and for two fault scenarios. The results were presented and discussed at the August 11-12 seismic design meetings in Las Vegas, and, based on these discussions, the fault table is being revised. It was agreed that the deterministic result would be presented as an appendix in the final seismic design report.

The completed PSHA draft report (SPG28PM4) was submitted to members to the PSHA review panel for their technical review. In addition, two parts of the PSHA final report--ground motion and seismic source characterization--were sent to the PSHA review panel for review. The results of the fault displacement hazard assessment are expected to be ready for review in mid-September.

Project staff completed their responses to reviewer comments on PISA sections 3.3.1 (Regional Geologic Setting), 3.3.2 (Tectonic Models), 3.3.4 (Seismicity and Seismic Hazards), and 3.3.5 (Surficial Geology and Erosion of Yucca Mountain), and prepared final copies of illustrative materials.

### **WBS 1.2.3.3 HYDROLOGY**

#### **Regional Hydrology**

The report documenting simulated responses to climate change was forwarded to the USGS Director for approval and to DOE for concurrence. To date, no questions were received that required response.

Revisions were completed to a journal article based on regional modeling work presented at the MODEL CARE96 symposium, and staff submitted the article to the journal and to USGS and DOE for approval and concurrence. An abstract, describing regional modeling efforts, was written, reviewed, and submitted to the American Geophysical Union (AGU) for inclusion into the fall meeting schedule.

Streamflow and precipitation data collected through July have been compiled and stored in project files.

#### **Unsaturated-Zone Hydrology**

Hydrologic investigations of the UZ continued with monitoring of borehole instrumentation networks. Borehole data from NRG-7a, UZ#4, UZ#5, UZ-7a, and SD-12 were transferred to Denver and archived to optical disk on a routine basis throughout the month. Daily EKES files were checked for any shelter activity. Sensor readings were checked daily as well for unusual occurrences. A data package (Deep Unsaturated-Zone Surface-Based Borehole Instrumentation Program - Interim Data Submittal) for boreholes USW NRG-7a, UE-25 UZ#4, UE-25 UZ#5, USW UZ-7a, and USW SD-12 for the period January 1 through June 30, 1997, was prepared and reviewed.

Staff visited NTS to fix sensors with problems, repair computers, and install a precision resistor at UZ-7a. Several instruments (Keithley 181 and 263; Datron 4808; Fluke 87 handheld multimeter) were sent for recalibration. Close-out calibrations were obtained for 15 instruments not expected to be used again (Keithley 220, 263 and 181; HP 3457). Thermistor and transducer calibration runs were performed.

Numerous trips were made to field sites for routine generator maintenance (13 trips), correction of UPS and generator problems (10 trips), and miscellaneous problems (three trips). Line power is being considered for the four operating field sites. Three-phase power has been run to the shelter which will be used as a teaching aid by an instructor from Deltec to teach UPS repair. Work was completed by electricians on August 22, and the UPS was restored to running order. The Deltec training class is scheduled for September 8 through 11. Eight additional trips were made to field sites for data-acquisition problems.

Investigation of matrix flow properties continued. Samples from the ESF Main Drift are being run on the high-pressure permeameter to ensure repeatability and to work out the bugs in the analytical process. Approximately 60 out of 70 samples from the Main Drift have been analyzed, and the work has produced reasonable permeability values. These permeabilities have been compared with porosity calculated from relative-humidity drying, and the relationship is well-correlated, as expected. Samples that were run on the low-pressure permeameter that were above the detection limit were also run on the high-pressure permeameter, and in almost all cases, calculated permeabilities were within one-half an order of magnitude of each other, which is the measurement error of repeated measurements on the low-pressure permeameter. Samples are being run in the centrifuge to collect moisture-retention data. Data package preparation is continuing on those data sets that were not yet submitted for approval.

New conversion equations were obtained for the filter-paper water-potential measurement technique and show much better results than previously measured for ESF alcove core samples. Samples from the two South Ramp boreholes and those selected from Alcove 6 show water-potential values that correlate well with the measured water content.

Level 4 milestone SPH35AM4 [Memo to TPO: Results of Matrix Hydrologic-Properties Determinations] has been completed. It reported the results of hydrologic-property determinations conducted in FY97 as well as other previously unreported data and results. Results discussed are based on data in the following data packages submitted for approval: "Physical properties of borehole samples from the ESF South Ramp (boreholes ESF-SR-MOISTSTDY#1 and #2)", DTN GS970808312231.005, and "Physical properties of surface samples from the ESF Main Drift (28+80 to 56+80 m)", DTN GS970708312231.004.

In air-permeability and hydrochemical testing in the Ghost Dance fault alcoves, cross-hole air-injection testing was conducted between boreholes MF#1 and MF#2 located in the Northern Ghost Dance Fault Alcove. Air-injection in isolated intervals in MF#2 resulted in increased pressure measurements in up to four monitoring intervals in MF#1. Preliminary permeability values of the Topopah Springs middle nonlithophysal unit (Tptpmn) near the fault are 14 darcies, and pneumatic porosity values are between 3 and 6 percent. These values are approximately one order of magnitude larger than expected and may be due to the larger zone of influence of the cross-hole tests. Cross-hole testing of the Ghost Dance Fault Zone is scheduled for early September.

Moisture monitoring in the ESF culminated in completion of level 4 milestone SPH36VM4 [Memo to TPO: Results of Analyses/Interpretations thru July 97]. A memo was written and submitted to the TPO detailing the analysis and interpretation of data collected in the ESF from February 1 to July 31, 1997. This activity is now finished.

South Ramp hydrologic studies continued with collection of water-potential data from the sets of tensiometers and heat-dissipation probes installed at ESF Stations 66+99 and 67+33. Water-content data were collected from the TDR instrumentation installed at Station 66+99. The areas around these instruments are still covered with plastic to monitor the recovery of the rocks from the drying effects due to tunnel ventilation and to interpret anomalies in the collected data.



Drilling continues on the 41 2-meter-deep boreholes in the South Ramp. Preparation continued of data packages for the heat-dissipation-probe and tensiometer data at Stations 66+99 and 67+33, the TDR data at Station 66+99, and the packer in borehole ESF-SR-MOISTSTD#1.

Studies of lateral diversion in the PTn also continued during the period. Twenty-one 2-meter boreholes were drilled in the North Ramp of the ESF, and core was collected. There generally was poor core recovery in the nonwelded- and bedded-tuff holes, and far fewer samples were collected than were needed to supply all the PIs and testing that had been planned. Geochemical analyses for isotopes (for dating and process interpretation) and tracers (to evaluate the penetration depth of the excavation water) therefore will be sporadic, covering only about half of the boreholes. Cores for property and saturation measurements were obtained from all but three holes. No borehole instrumentation has yet been installed, but all the boreholes have plugs to reduce drying.

Cores were prepared for unsaturated hydraulic-conductivity and moisture-retention measurements using the steady-state centrifuge, and several were broken in the process. Nineteen samples were eventually sent out for measurements, and to date, 10 conductivity data sets have been completed by UFA Ventures, Inc., a fully QA-qualified facility. All preserved core samples have been tested for properties and saturation, and preliminary analysis suggests that the drying front penetrates to between 0.3 and 0.7 meters, depending on the lithology. Beyond the drying front, the welded and moderately welded Tiva Canyon samples were moderately wet, at 80% and 60% saturation, respectively. The wettest holes were in the Tiva Canyon crystal-poor vitric zone (units Tpcpv2 and Tptrv1) and the two lower holes in Alcove 4, in bedded tuffs Tpbt2-argillic and Tpbt2, above 95% saturation. The remaining holes were much drier, between 15% and 65% saturation. Analysis is ongoing, and data package preparation has been initiated for the preserved sample measurements. The other PIs have been sent their samples.

Active efforts in UZ hydrochemistry continued. Dissolved CO<sub>2</sub> was collected from two NRG-7A core samples using both the distillation and acidification methods for collecting dissolved CO<sub>2</sub>. The four dissolved CO<sub>2</sub> gas samples were prepared and shipped to Beta Analytic, Inc. for carbon isotope analysis. Sixteen molecular-sieve cylinders were leak-tested and heat-evacuated to remove residual CO<sub>2</sub> gas and water vapor. The evacuated cylinders were pressurized with nitrogen gas and prepared for shipment to the NTS. Pore water was collected from two NRG-7A core samples using distillation methods. The water samples will be analyzed for tritium, deuterium/hydrogen (D/H), and <sup>18</sup>O/<sup>16</sup>O. Staff reviewed lithologic logs of boreholes NRG-7A, SD-7, SD-9, SD-12 and UZ-7A and arranged shipment of chosen samples. Pore water was extracted from nine SD-12 core samples (all from the Calico Hills Formation) using one-dimensional compression methods. Three NRG-7A and six SD-9 core samples were distilled for pore water, mixed with the scintillation cocktails, and counted in the liquid scintillation counter for tritium concentration, and the data were reduced. Nine ESF pore water samples were prepared for tritium-concentration analysis, also with reduction of data.

Water collection by compression and distillation methods during August was recorded in the water-collection database. Tritium concentrations measured in August were entered into the

tritium database. Data packages for FY1997 data will be prepared in the first week of September and sent out for technical and QA reviews.

Staff drafted a paper titled *Comparison of  $^{14}\text{C}$  data on pore-water samples collected by vacuum-distillation and one-dimensional compression* for the level 4 milestone which is due in September.

In unscheduled work, staff performed a technical review of a data package containing records of collection and extraction of soil gas  $\text{CO}_2$  for stable isotopic analysis. A draft report was completed for the Geochemistry and Isotope section of the PISA Hydrology section, including discussion of chlorine-36 results from LANL. An abstract was prepared for submission to the American Geophysical Union Fall meeting to be held in San Francisco December 8 through 12. The abstract was reviewed and approved by the USGS and DOE. Editorial comments from the YMPB Implementation Team were received related to the isotopic and hydrochemical milestone paper submitted to DOE last December; resolution of comments and responses were started. The paper is in the processes for publication as USGS water-resources investigation (WRIR) report. Staff also responded to QA comments on the scientific notebook for the stable-isotope imbibing test.

#### Saturated-Zone Hydrology

In work on tracer testing at the C-hole complex, minor revisions and corrections were made to the completed milestone report *Results of hydraulic and conservative tracer tests in the Miocene tuffaceous rocks at the C-hole complex, 1995 to 1997, Yucca Mountain, Nye County, Nevada*. Copies were sent to the SZ Expert Elicitation Panel and to the total-system performance assessment group at Sandia National Laboratory.

Potentiometric-level monitoring continued. The water-level network includes 31 zones in 24 wells to be measured manually. For the month of July, 11 manual measurements were completed. Three zones in three wells were monitored hourly with transducer measurements. Monitored wells include UE-25 WT#14, UE-25 p#1 and USW H-4 (upper interval). Water-level measurements were made at UE-25 b#1 (upper interval), USW H-1 tubes 1, 2, 3, and 4, and USW H-4 (lower interval), on August 6; USW WT-1, USW WT-2, and USW H-3 (upper interval) on August 7; and USW G-2 and J-13 on August 8. Data were downloaded from recorders at wells USW H-4 (upper interval), UE-25 WT #3, UE-25 WT #14, and UE-25 p#1. A data package for manual water-level data collected from January through June 1997 was submitted for review. Review of the data package was completed on August 26.

Construction of borehole WT-24 continued during the period. During August, the M&O drilled from 119 to 371.1 feet below land surface. During August several requests/reminders were made to the M&O to put a monitoring tube back into borehole USW G-2. The monitoring tube in borehole USW G-2 was removed during late June/early July, so that the pump could be removed from the borehole. The monitoring tube was not replaced before the drill rig was removed from the site. Borehole USW G-2 will be used as an observation well to monitor the eventual pumping at borehole USW WT-24 when hydraulic testing is conducted. It is critical that the monitoring tube in borehole USW G-2 be replaced as soon as possible, so that testing of

the transducers and data loggers that will be used in support of the hydraulic testing can begin. Preparation of the test package to be used at WT-24 began. The test package includes instructions for calibration check of the Paroscientific transducers and data collection on the CR-10 data logger.

Staff provided additional information for the predictive report for borehole USW SD-6 by summarizing the location of perched-water bodies in boreholes USW SD-9, USW SD-12, USW G-2, USW UZ-1, USW UZ-14, and USW SD-7, and discussing the general location of borehole USW SD-6 with respect to the moderate hydraulic gradient.

Work continued on the site-scale SZ synthesis report, with responses to technical and supervisory review comments and on extensive revisions to the report. Additional model simulations were performed as required by reviews. An interactive review of the report was held in Denver on August 5 and 6; participants included the senior author, his supervisor, DOE, and M&O representatives.

In work on the UZ flow-model sensitivity analysis, work on calculation of particle flow paths and fluxes for present, past, and future climate conditions, based on regional flow model output was completed and submitted for review. Work also continued on incorporation into the regional flow model of data recently obtained by the Nevada District (USGS) concerning evapotranspiration from Ash Meadows. This information will be used in the sensitivity analyses for TSPA-VA.

Alternate conceptual models of the large hydraulic gradient were discussed in detail at the third SZ Expert Elicitation workshop August 11 and 12, in San Francisco. Panel members heard arguments concerning pros and cons of each model, and the panel members provided their initial interpretations of the causes of the large hydraulic gradient and received feedback and additional information from participants. Members of the SZ Modeling Unit assembled and prepared documents to be provided to the panel to assist them in their evaluation of model uncertainty. This task is completed for this activity. Evaluation of alternate conceptual models, however, will continue under both regional and site-scale modeling activities.

In efforts to confirm SZ hydrologic flow models, staff worked on calibration of the flow model in response to review comments. A refined mesh was generated, and a revised estimate of simulated fluxes at Fortymile Wash was entered into the model. Parameter-estimation simulations with these revisions continued through the end of the month.

### **WBS 1.2.3.6 CLIMATOLOGY and PALEOHYDROLOGY**

Staff continued assembly of hydrologic and climatic data for the Owens Lake region to develop analog models for determining precipitation and temperature changes for the past 400 ky. The modern data sets are then being discussed in a manuscript detailing the relationship between the modern climatology, hydrology and limnology of Owens Lake to serve as background for paleoclimatic studies. Work also continued on ostracode morphological change through long Quaternary lake records in order to document within-species range changes that may enhance the

paleoclimatic resolving power of the ostracode record. Revised Owens Lake diatom and ostracode data packages were prepared and resubmitted in compliance with level 4 milestone SPC331M4 [submit data/analyses FY97 to RPC].

Collection of data from critical ground-water flow sites continued with collection of ostracode data from the Las Vegas and Indian Springs Valley deposits for stable isotope analyses.

Work on the paleoclimate synthesis report continued during the period. Staff members are working on a manuscript that treats the climate and hydrologic states that existed in the Las Vegas and Indian Springs Valleys during the Pleistocene in support of level 4 milestone SPC332M4 [update FY96 synthesis report]. Another manuscript is being prepared to detail the modern climatology, hydrology and limnology of Owens Lake to serve as background for paleoclimate studies. The results also will allow quantitative analog interpretations of past climate states at Yucca Mountain and support milestone SPC332M4. A memorandum to the TPO was submitted in compliance with milestone SPC332M4 providing a bibliography of various submitted, in review, in press, and published papers in support of the climate program.

Work on evaluation of paleo ground-water discharge continued with completion of a U-Th isotope data package for analyses of past-discharge materials from Amargosa discharge sites, as well as pedogenic materials from Fortymile Wash sites and trench CFFT-2 in northern Crater Flat. The package was submitted to the data management group in support of milestone SPC333M4. A memo report presenting a summary evaluation of past discharge sites scattered throughout the Amargosa Desert and adjacent Crater Flat was completed. The deposits provide evidence of water-table elevations up to 100 m higher than present altitudes throughout the last two pluvial climate cycles. The saturated zone responded rapidly to the onset of increased recharge due to wetter, cooler conditions as recorded in regional climate-proxy records. The memo was submitted to the USGS-YMPB-TPO and represents completion of level 4 milestone SPC333M4 [evaluation paleodischarge sites].

A poster was completed for presentation at a OECD/NEA (European/French radioactive waste community) Coordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal Workshop in Borgholm, Sweden. The workshop title is Use of Hydrogeochemical Information in Testing Groundwater Flow Models. The title of the poster is *Constraints on Quaternary Unsaturated- and Saturated-Zone Hydrology from Geochronological and Isotopic Studies of Calcite And Silica, Yucca Mountain, Nevada, USA* by J. Paces, Z. Peterman, L. Neymark, J. Whelan and B. Marshall. The presentation summarizes work on subsurface mineral deposits as records of past UZ flux and on discharge deposits down-gradient from Yucca Mountain as records of past SZ high-water stands.

Staff processed 25 samples of carbonate-rich material from paleo discharge sites near the State Line area for U-series disequilibrium analysis. Material with authigenic cements commonly contains elevated Th contents or excess  $^{230}\text{Th}$  relative to  $^{234}\text{U}$ , both of which limit the usefulness of the analysis to provide reliable  $^{230}\text{Th}/\text{U}$  ages. Subsamples that provide finite ages and initial  $^{234}\text{U}/^{238}\text{U}$  ratios tend to confirm previous results indicating discharge activity in the earlier portions of the last pluvial cycle as well as during previous cycles. Deposits associated with

latest portions of the late Pleistocene pluvial event (that is, 30 to 10 ka) are not well represented in materials from the high-carbonate terrace in the Franklin Well and Scranton Well areas.

Staff performed a series of experiments on analyzing radium isotopes by mass spectrometry. Initial calibration of the  $^{228}\text{Ra}$  spike was performed after which it was determined that the spike solution required further cleaning. A test of the system was performed on an outermost opal and calcite from ESF occurrences. Complete characterization of the U-Th-Ra system was not made; preliminary results, however, are not inconsistent with possible deposition of the outermost layers in the last 10 ka. Additional refinements of the technique are required before reliable results can be obtained.

Approximately 10 new samples of outermost opal were obtained from ESF occurrences from the South Ramp. Samples were submitted for chemical processing in order to characterize U-Th isotopes and  $^{230}\text{Th}/\text{U}$  ages and initial  $^{234}\text{U}/^{238}\text{U}$ .

Climate staff completed a review draft of a manuscript titled *Mixed  $^{230}\text{Th}/\text{U}$  ages for subsurface opals due to slow rates of deposition, Yucca Mountain, Nevada, USA* intended for publication in the peer-reviewed journal *Earth and Planetary Science Letters*. Technical reviews of the manuscript were completed, and comments have been returned to the authors.

Line surveys of secondary mineral occurrences in the last portion of the ESF South Ramp between stations 71 and 78 were completed. In addition, 13 samples from fracture walls, lithophysal cavity floors or vapor-phase partings were collected between stations 75 and 78. This work completes the first phase of ESF sampling and surveying except for Ghost Dance alcoves, niches, and the ESF North Ramp between stations 0 and about 10. Samples were brought back to Denver and were cleaned and cataloged.

Staff completed a first-draft manuscript titled *Paleo unsaturated-zone hydrology from geochronological and isotopic studies of calcite and silica, Yucca Mountain, Nevada, USA*, authored by J. Paces, L. Neymark, J. Whelan, B. Marshall, Z. Peterman and Yu V. Amelin and intended for submission to the peer-reviewed journal *Geology*. The manuscript presents a broad summary of the work done on UZ secondary minerals and some of the implications that the data place on paleohydrology through the UZ. The manuscript is currently receiving co-author review.

In unscheduled work, several small UZ opal samples were sent to the University of Michigan for evaluation of the effectiveness of U-series analysis using a laser-ablation ICP-MS technique. Analytical methods used at the USGS lab restrict opal samples to thickness of about 100 to 200 microns. Even these tiny samples may represent many tens of thousands of years of mineral deposition if growth rates are as low as 1 mm per million years as implied by the available U-series and U-Pb data. Use of the laser ablation ICP-MS allows spot sizes on the order of 10 to 20 microns to be carefully manipulated across the thickness of an opal band. If successful, this technique may allow verification of the continuous versus episodic nature of secondary mineral growth and may be able to resolve the issue of climate influence or lack thereof on UZ secondary mineral growth.

Staff also met with T. Yanosky (USGS-National Research Program-Reston) to discuss petrified plant materials preserved in Yucca Mountain soils and discharge deposits. Yanosky is an expert in modern plant physiology and dendrology. He felt that it may be possible to extract additional information about the paleoecology of these sites by examining the calcite- and silica-replaced roots and stems. He took a small suite of materials back to his Reston lab for examination.

#### **WBS 1.2.3.9 SPECIAL STUDIES**

In preparation for compilation of SCPR #17 (April-September 1997), the AM Concurrence Draft of SCPR #16 was retrieved electronically from the M&O SCPR coordinator and subdivided into separate files representing the SCP studies and activities on which the USGS will report for SCPR #17. Using the AM Concurrence Draft for SCPR #16, templates were prepared for each SCP study for use by USGS PIs to input progress and forecast narratives. The templates contain updated objective statements for each SCP study and activity and place holders for progress and forecast narratives. In at least one case (ESF Percolation Test), the SCP activity has been further subdivided into summary accounts to facilitate reporting of progress. The instructional memorandum for preparation of SCPR input was reviewed and adjusted for SCPR #17. Although plans were finalized to distribute the instructional memo, the relevant parts of SCPR #16, and the templates for SCPR #17 to all USGS PIs in mid-August, an impending change in the SCPR format has delayed distribution about one month.

A concept document describing proposed revisions to SCPR format and content was received for review from the M&O SCPR coordinator. Changes in SCPR format and content have been proposed in response to requests from the NRC and other oversight groups that future SCPRs be smaller, released sooner, and contain only highlighted information, rather than the fairly detailed descriptions at the SCP activity level presently in the SCPR. The proposed plan calls for summarizing technical progress at the SCP Program or Investigation level and providing more direct informational links between the technical work and major Project milestones and the waste-containment and isolation strategy. Under the revised format, it is anticipated that future SCPR's would be compiled, reviewed, and released much sooner than in the past. In early August a decision was made to implement the new SCPR format beginning with #17. As a result, the kickoff for SCPR #17 and the distribution of input guidelines was delayed about one month. Under the revised schedule, USGS PIs will receive SCPR #17 input instructions the week of September 15; input from PIs will be due to the USGS technical lead the week of September 29. Consolidated USGS input will be due to the M&O Site Evaluation Program Office by October 10 and to the M&O SCPR coordinator by October 22. Any necessary changes to Appendix A will be developed in a similar time frame.

#### **WBS 1.2.8.4.7 WATER RESOURCES MONITORING**

Ground-water monitoring continued with measurement of ground-water levels at 33 sites and ground-water discharge at five springs and one flowing well. Supplemental information was

provided to USGS-ESIP personnel for final preparation of the 1996 data records package. The draft calendar-year 1996 summary monitoring report was completed and submitted for supervisory review. Transcription checks and comment resolution were conducted. Review comments were addressed, and the report was submitted for further review on August 18. Revisions began on August 21 after the colleague and editorial reviews.

Review of preliminary analytical data received from USGS National Water-Quality Laboratory (NWQL) and stored in the USGS-Nevada District NWIS database continued during the period. Water-quality samples were collected in support of the Radiological/Environmental Field Programs for the fourth quarter of FY 1997.

WBS No. - 1.2 WBS Title - Yucca Mountain Project Parent WBS No. - 1.0 Parent WBS Title - Mined Geologic Disposal System	Element ID - 12
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Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance														
Id	Description	Current Period					FY1997 Cumulative to Date					FY1997 at Completion		
		BCWS	BCWP	ACWP	SV	CV	BCWS	BCWP	ACWP	SV	CV	BAC	EAC	VAC
1.2.1	Systems Engineering	60	60	29	0	31	120	120	100	0	20	181	167	14
1.2.3	Site Investigations	1237	1137	1253	-100	-116	11682	11853	10921	171	932	12984	12976	8
1.2.5	Regulatory	46	46	60	0	-14	458	458	399	0	59	504	470	34
1.2.8	Environment, Safety, and H	52	52	66	0	-14	562	562	624	0	-62	612	699	-87
1.2.9	Project Management	64	64	70	0	-6	609	609	568	0	41	664	632	32
1.2.12	Information Management	8	8	16	0	-8	73	73	60	0	13	80	75	5
1.2.15	Support Services	143	143	164	0	-21	1578	1578	1540	0	38	1722	1744	-22
Total		1610	1510	1658	-100	-148	15082	15253	14212	171	1041	16747	16763	-16

Resource Distributions by Element of Cost													
Fiscal Year 1997													
Budgeted Cost of Work Scheduled													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	19540	19599	16166	20824	21557	21010	23147	23329	24443	26495	26479	27320	269909
LABOR	885	899	632	866	886	935	948	959	1009	1116	1133	1207	11475
SUBS	139	143	87	148	145	145	225	150	159	168	167	149	1825
TRAVEL	25	43	34	45	43	53	43	43	50	65	71	64	579
PM&E	7	6	7	5	9	6	7	6	9	7	5	4	78
OTHER	197	201	179	206	293	241	248	253	193	304	234	241	2790
Total BCWS	1253	1292	939	1270	1376	1380	1471	1411	1420	1660	1610	1665	16747
Actual Cost of Work Performed													
LBRHRS	19283	18578	18523	18723	17133	18725	19233	19288	18237	19855	17120	0	204698
LABOR	771	712	732	829	727	782	788	826	788	836	936	0	8727
SUBS	127	139	117	185	134	179	226	134	236	176	280	0	1933
TRAVEL	11	24	61	53	42	46	44	57	48	30	37	0	453
PM&E	43	16	88	85	89	110	60	192	98	105	160	0	1046
OTHER	119	129	145	158	252	239	174	165	194	233	245	0	2053
Total ACWP	1071	1020	1143	1310	1244	1356	1292	1374	1364	1380	1658	0	14212



WBS No. - 1.2 - Yucca Mountain Project

### Resource Distributions by Element of Cost

**Fiscal Year 1997**

**Estimate to Complete**

[illegible]

## Resource Distributions

[illegible]

### Fiscal Year Distribution

[illegible]

# USGS FY1997 Milestones Due By October 31, 1997

## Level 3

### Sorted by TEAM and WBS

#### IMPLEMENTATION TEAM

WBS: 1.2.3.2.8.3.6

Responsible Staff: J.W Whitney

Milestone: SP32IM3

Baseline Date: 8/29/97

TITLE: PSHA Final Report

Expected Date 11/14/97

Actual Date:

#### HYDROLOGIC MODELING TEAM

WBS: 1.2.3.2.2.1.2

Responsible Staff: W. Day

Milestone: SPG22M3

Baseline Date: 8/29/97

TITLE: Geol. Map of the Yucca Mountain Site Area

Expected Date 8/22/97

Actual Date: 8/22/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: D.S Sweetkind

Milestone: SPG32M3

Baseline Date: 4/30/97

TITLE: Complete Fracture Evaluation Report

Expected Date 4/29/97

Actual Date: 4/29/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: S.C Beason

Milestone: SPG42AM3

Baseline Date: 2/28/97

TITLE: Rpt Geo North/South Main Drft Sta 28+00 to55+00

Expected Date 2/28/97

Actual Date: 2/28/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: S.C Beason

Milestone: SPG42BM3

Baseline Date: 2/28/97

TITLE: Ltr Rpt: Geo S.R. Sta 55+00 to STA 63+47

Expected Date 2/27/97

Actual Date: 2/27/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: S.C Beason

Milestone: SPG42CM3

Baseline Date: 8/29/97

TITLE: Ltr Rpt: Geo of S.Ramp, Sta 55+00 to S. Portal

Expected Date 8/29/97

Actual Date: 8/29/97

WBS: 1.2.3.3.1.1.4

Responsible Staff: P. Tucci

Milestone: SP23OM3

Baseline Date: 8/1/97

TITLE: Regional Saturated-Zone Synthesis Report

Expected Date 8/1/97

Actual Date: 8/1/97

## **HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: C.L. Loskot**

**Milestone: SPH223M3**

**Baseline Date: 3/14/97**

**TITLE: Main Drift Hydrogeology Report**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: G.L. Patterson**

**Milestone: SP3500M3**

**Baseline Date: 5/16/97**

**TITLE: Initiate North Gdf Alcove Testing**

**Expected Date 5/15/97**

**Actual Date: 5/15/97**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: G.L. Patterson**

**Milestone: SP3505M3**

**Baseline Date: 4/18/97**

**TITLE: Initiate South GDF Testing Geothermal Borehole**

**Expected Date 4/10/97**

**Actual Date: 4/10/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: M.J. Umari**

**Milestone: SP23PM3**

**Baseline Date: 8/1/97**

**TITLE: Results of Hydraulic & Tracer Tests C-Hole Compl**

**Expected Date 8/1/97**

**Actual Date: 8/1/97**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SP23NM3**

**Baseline Date: 8/29/97**

**TITLE: Site Saturated-Zone Synthesis Report**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SP24CBM3**

**Baseline Date: 6/16/97**

**TITLE: Site Saturated-Zone Flow Model**

**Expected Date 6/16/97**

**Actual Date: 6/16/97**

**WBS: 1.2.8.4.7**

**Responsible Staff: R.J. LaCamera**

**Milestone: SSH13BM3**

**Baseline Date: 11/1/96**

**TITLE: LETTER REPORT**

**Expected Date 10/30/96**

**Actual Date: 10/30/96**

**WBS: 1.2.8.4.7**

**Responsible Staff: R.J. LaCamera**

**Milestone: SSH13CM3**

**Baseline Date: 1/31/97**

**TITLE: LETTER REPORT**

**Expected Date 1/30/97**

**Actual Date: 1/30/97**

**HYDROLOGIC MODELING TEAM**

**WBS: 1.2.8.4.7**

**Responsible Staff: R.J. LaCamera**

**Milestone: SSH13DM3**

**Baseline Date: 5/1/97**

**TITLE: LETTER REPORT**

**Expected Date 4/29/97**

**Actual Date: 4/29/97**

**WBS: 1.2.8.4.7**

**Responsible Staff: R.J. LaCamera**

**Milestone: SSH13EM3**

**Baseline Date: 8/1/97**

**TITLE: LETTER REPORT**

**Expected Date 7/28/97**

**Actual Date: 7/28/97**

**WBS: 1.2.8.4.7**

**Responsible Staff: R.J. LaCamera**

**Milestone: SSH13GM3**

**Baseline Date: 9/15/97**

**TITLE: REPORT: SUMMARY MONITORING THROUGH CY 1996**

**Expected Date 9/15/97**

**Actual Date:**

**Prepared by: T.L. Williams**

# **USGS FY1997 Milestones Due By October 31, 1997**

## **Level 4**

### **Sorted by TEAM and WBS**

#### **ENVIRONMENTAL SCIENCE TEAM**

**WBS: 1.2.3.3.1.1.1**

**Responsible Staff: A.L. Flint**

**Milestone: SPH21IM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Meteorological Data FY96 to RPC/TDB**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.1.2**

**Responsible Staff: D.A. Beck**

**Milestone: SPH22CM4**

**Baseline Date: 3/14/97**

**TITLE: Publish Sel Streamflow & Precip Data for FY96**

**Expected Date 9/4/97**

**Actual Date:**

**WBS: 1.2.3.3.1.1.2**

**Responsible Staff: D.A. Beck**

**Milestone: SPH22DM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Subm FY96 Data to RPC/TDB**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.2.1**

**Responsible Staff: A.L. Flint**

**Milestone: SPH22FM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Trans Funct Precip/Infil of Num Mdl**

**Expected Date 3/11/97**

**Actual Date: 3/11/97**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: L.E. Flint**

**Milestone: SPG33SM4**

**Baseline Date: 7/15/97**

**TITLE: Memo to TPO: Provide Pred Property Value, WT-24**

**Expected Date 7/15/97**

**Actual Date: 7/15/97**

**ENVIRONMENTAL SCIENCE TEAM**

**WBS:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPG33TM4

**Baseline Date:** 7/31/97

**TITLE:** Memo to TPO: Provide Pred Property Value, SD-6

**Expected Date** 7/30/97

**Actual Date:** 7/30/97

**WBS:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPH22KM4

**Baseline Date:** 3/14/97

**TITLE:** Memo to TPO: Reslt of Matrix-Hydro-Prop Determin

**Expected Date** 3/11/97

**Actual Date:** 3/11/97

**S:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPH22LM4

**Baseline Date:** 3/14/97

**TITLE:** Memo to TPO: Matrix-Hydro-Prop Compl Pkg to RPC

**Expected Date** 3/11/97

**Actual Date:** 3/11/97

**WBS:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPH235M4

**Baseline Date:** 9/30/97

**TITLE:** Memo to Tpo: Hydro-Property Measurements

**Expected Date** 9/30/97

**Actual Date:**

**WBS:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPH236M4

**Baseline Date:** 9/30/97

**TITLE:** Memo to Tpo: Docmnt Data Package Submittal

**Expected Date** 9/30/97

**Actual Date:**

**WBS:** 1.2.3.3.1.2.3

**Responsible Staff:** L.E. Flint

**Milestone:** SPH35AM4

**Baseline Date:** 8/29/97

**TITLE:** Memo to TPO: Reslt of Matrix-Hydro-Prop Determin

**Expected Date** 8/29/97

**Actual Date:** 8/29/97

**ENVIRONMENTAL SCIENCE TEAM**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: L.E Flint**

**Milestone: SPH35BM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Matrix-Hydro-Prop Compl Pkg to RPC**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH22QM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Rslts Analyses/Interpret thru Jan97**

**Expected Date 3/11/97**

**Actual Date: 3/11/97**

**S: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH22RM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Data Collected thru Jan 97 to RPC**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH34AM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data Pkg of Core/Bh Data Mar-Jul 97**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH34BM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data & Rslts Analys/Inter Mar-Aug 97**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: L.E Flint**

**Milestone: SPH34CM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data Pkg of Core/Bh Data Mar-Jul 97**

**Expected Date 9/30/97**

**Actual Date:**

**ENVIRONMENTAL SCIENCE TEAM**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: L.E Flint**

**Milestone: SPH34DM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data&RsIts Analys/Inter Mar-Aug 97**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH35PM4**

**Baseline Date: 8/29/97**

**TITLE: Memo to TPO: Plan In-situ Fld Est Perc Flux Rate**

**Expected Date 8/29/97**

**Actual Date: 8/29/97**

**S: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH36VM4**

**Baseline Date: 8/29/97**

**TITLE: Memo to TPO: RsIts Analyses/Interpret thru Jul97**

**Expected Date 8/29/97**

**Actual Date: 8/29/97**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: A.L Flint**

**Milestone: SPH36WM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data Collected thru July 97 to RPC**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.3.1.2.7**

**Responsible Staff: I.C. Yang**

**Milestone: SPH22WM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: RsIts Chem Analysis Thru Jan 1997**

**Expected Date 3/10/97**

**Actual Date: 3/10/97**

**WBS: 1.2.3.3.1.2.7**

**Responsible Staff: I.C. Yang**

**Milestone: SPH22XM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Pkg of Chem Anal thru Jan 97 to RPC**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**



**ENVIRONMENTAL SCIENCE TEAM**

**WBS: 1.2.3.3.1.2.7**

**Responsible Staff: I.C. Yang**

**Milestone: SPH37DM4**

**Baseline Date: 6/13/97**

**TITLE: Memo to TPO:Baseline Hydchem Meas Drft Scale Tst**

**Expected Date 6/10/97**

**Actual Date: 6/10/97**

**WBS: 1.2.3.3.1.2.7**

**Responsible Staff: I.C. Yang**

**Milestone: SPH37EM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Data Pkg of Chem Anal Fy97 to RPC**

**Expected Date 9/30/97**

**Actual Date:**

**S: 1.2.3.3.1.3.1**

**Responsible Staff: Z.E. Peterman**

**Milestone: SPC34BM4**

**Baseline Date: 7/31/97**

**TITLE: Memo to TPO: Data Pkg of Existing SZ Chem Data**

**Expected Date 7/22/97**

**Actual Date: 7/22/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: Z.E. Peterman**

**Milestone: SPC34CM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Chem/Iso Anlys on Wtr Samples WT-17**

**Expected Date 11/28/97**

**Actual Date:**

**WBS: 1.2.3.6.2.1.2**

**Responsible Staff: R. Forester**

**Milestone: SPC331M4**

**Baseline Date: 9/30/97**

**TITLE: Data to CRF: FY97 Data Collected & Analyses**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.6.2.1.5**

**Responsible Staff: R. Forester**

**Milestone: SPC332M4**

**Baseline Date: 8/29/97**

**TITLE: Subm Upd FY96 Synth Report to Peer-Revwd Journal**

**Expected Date 8/26/97**

**Actual Date: 8/26/97**

**ENVIRONMENTAL SCIENCE TEAM**

**WBS: 1.2.3.6.2.2.1**

**Responsible Staff: B.D Marshall**

**Milestone: SPC23FM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Rslts New Age & Iso Determinations**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.6.2.2.1**

**Responsible Staff: B.D Marshall**

**Milestone: SPC23MM4**

**Baseline Date: 9/30/97**

**TITLE: Data to CRF: Data & Analyses Completed FY97**

**Expected Date 9/30/97**

**Actual Date:**

**S: 1.2.3.6.2.2.1**

**Responsible Staff: J.B. Paces**

**Milestone: SPC333M4**

**Baseline Date: 8/29/97**

**TITLE: Memo to TPO: Eval Data fm Paleo-Discharge Sites**

**Expected Date 8/27/97**

**Actual Date: 8/27/97**

**WBS: 1.2.3.6.2.2.1**

**Responsible Staff: J.B. Paces**

**Milestone: SPC334M4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Collected/Analyses FY97 Data to RPC**

**Expected Date 9/30/97**

**Actual Date:**

**WBS: 1.2.3.9.B**

**Responsible Staff: R. Forester**

**Milestone: SPC321M4**

**Baseline Date: 8/15/97**

**TITLE: Memo to TPO: Status of Prep of PISA Chapter 2.6**

**Expected Date 7/28/97**

**Actual Date: 7/28/97**

**HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.2.2.1.1**

**Responsible Staff: R. Spengler**

**Milestone: SPG211M4**

**Baseline Date: 2/28/97**

**TITLE: Memo to TPO: Sub Bh Video Frac Db to GENISES**

**Expected Date 2/27/97**

**Actual Date: 2/27/97**

## HYDROLOGIC MODELING TEAM

WBS: 1.2.3.2.2.1.1

Responsible Staff: R. Spengler

Milestone: SPG212M4

Baseline Date: 3/28/97

TITLE: Memo to TPO: Comp QA Eval pre-1992 Bh Geo Logs

Expected Date 3/26/97

Actual Date: 3/26/97

WBS: 1.2.3.2.2.1.1

Responsible Staff: R. Spengler

Milestone: SPG21M4

Baseline Date: 12/13/96

TITLE: Memo to TPO: Comp Re-Eval Priority Strat Contact

Expected Date 12/13/96

Actual Date: 12/13/96

S: 1.2.3.2.2.1.2

Responsible Staff: W. Day

Milestone: SPG222M4

Baseline Date: 4/18/97

TITLE: Memo to TPO: Draft Site Area Geol. Map to PISA

Expected Date 4/17/97

Actual Date: 4/17/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: D.S Sweetkind

Milestone: SPG32M4

Baseline Date: 6/10/97

TITLE: Memo to TPO: Reviewed Data Package to TDB

Expected Date 6/9/97

Actual Date: 6/9/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: D.S Sweetkind

Milestone: SPG33M4

Baseline Date: 8/29/97

TITLE: Memo to TPO: Maps, Data, Interpretations & Concl

Expected Date 8/29/97

Actual Date: 8/29/97

WBS: 1.2.3.2.2.1.2

Responsible Staff: D.S Sweetkind

Milestone: SPG34M4

Baseline Date: 11/27/96

TITLE: Memo to TPO: Comp Frac Data Coll:Cal. Hills,Prow

Expected Date 11/27/96

Actual Date: 11/27/96

**HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.2.2.1.2**

**Responsible Staff: S.C Beason**

**Milestone: SPG42FM4**

**Baseline Date: 6/30/97**

**TITLE: Memo to TPO: Comp Geo Mapping of Thermal Tst Are**

**Expected Date 6/27/97**

**Actual Date: 6/27/97**

**WBS: 1.2.3.3.1.1.4**

**Responsible Staff: P. Tucci**

**Milestone: SPH23AM4**

**Baseline Date: 1/30/97**

**TITLE: Memo to TPO: Clim Scenarios Recvd & Sim Started**

**Expected Date 1/13/97**

**Actual Date: 1/13/97**

**S: 1.2.3.3.1.1.4**

**Responsible Staff: P. Tucci**

**Milestone: SPH23BM4**

**Baseline Date: 5/1/97**

**TITLE: Memo to TPO: Rev Dft Reg SZ Synth Rpt Clim Chng**

**Expected Date 5/1/97**

**Actual Date: 5/1/97**

**WBS: 1.2.3.3.1.1.4**

**Responsible Staff: P. Tucci**

**Milestone: SPH23DM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Final Hydrogeo Framewrk Data to RPC**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: C.L Loskot**

**Milestone: SPH22GM4**

**Baseline Date: 12/31/96**

**TITLE: Memo to TPO: Monitoring Data Apr-Sep 1996 to RPC**

**Expected Date 12/23/96**

**Actual Date: 12/23/96**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: C.L Loskot**

**Milestone: SPH22IM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Synth UZ Mont Data fm MD of ESF**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.3.1.2.3**

**Responsible Staff: C.L. Loskot**

**Milestone: SPH22NM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Monitoring Data Thru Jan 97 to RPC**

**Expected Date 3/7/97**

**Actual Date: 3/7/97**

**WBS: 1.2.3.3.1.2.4**

**Responsible Staff: G.L. Patterson**

**Milestone: SPH35EM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Tech Anal/Interp Air-Perm & Hydroch**

**Expected Date 3/13/97**

**Actual Date: 3/13/97**

**S: 1.2.3.3.1.2.4**

**Responsible Staff: G.L. Patterson**

**Milestone: SPH35FM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Subm Air-Perm/Hydrochem Tstg to RPC**

**Expected Date 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.2.8**

**Responsible Staff: L.O. Anna**

**Milestone: SPH21AM4**

**Baseline Date: 12/31/96**

**TITLE: Report: Mod Flow In UZ Frac Ntwk TS W-U in ESF**

**Expected Date 12/19/96**

**Actual Date: 12/19/96**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: R.P. Graves**

**Milestone: SP256M4**

**Baseline Date: 7/31/97**

**TITLE: Memo To TPO: Prov Pred Hydro Property SD-6**

**Expected Date 7/29/97**

**Actual Date: 7/29/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: R.P. Graves**

**Milestone: SPH21BM4**

**Baseline Date: 2/28/97**

**TITLE: Memo to TPO: Jul-Dec96 Perio Wtr Lvl Data to RPC**

**Expected Date 2/7/97**

**Actual Date: 2/7/97**

## **HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: R.P Graves**

**Milestone: SPH21CM4**

**Baseline Date: 10/31/96**

**TITLE: Memo to TPO: Jan-Jun96 Perio Wtr Lvl Data to RPC**

**Expected Date: 10/30/96**

**Actual Date: 10/30/96**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: R.P Graves**

**Milestone: SPH21FM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: 1995 Water-Level Data**

**Expected Date: 2/13/97**

**Actual Date: 2/13/97**

**S: 1.2.3.3.1.3.1**

**Responsible Staff: M.J Umari**

**Milestone: SPH233M4**

**Baseline Date: 8/15/97**

**TITLE: Memo to TPO: Status of Hydra&Tracer Tst Prow Pass**

**Expected Date: 8/11/97**

**Actual Date: 8/11/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: G.L Patterson**

**Milestone: SPH23FM4**

**Baseline Date: 7/15/97**

**TITLE: Memo to TPO: Predicted SZ Chemical Parameters**

**Expected Date: 7/14/97**

**Actual Date: 7/14/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: M.J Umari**

**Milestone: SPH23MM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Test Data for July-Dec 1996 to RPC**

**Expected Date: 3/14/97**

**Actual Date: 3/14/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: M.J Umari**

**Milestone: SPH23NM4**

**Baseline Date: 3/14/97**

**TITLE: Memo to TPO: Results of Tests Comp Jul-Dec 96**

**Expected Date: 3/14/97**

**Actual Date: 3/14/97**

**HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: M.J Umari**

**Milestone: SPH23SM4**

**Baseline Date: 6/30/97**

**TITLE: Memo to TPO: Rev Drft Rslts Hydra&Tracer Tsts C-**

**Expected Date 7/9/97**

**Actual Date: 7/9/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: M.J Umari**

**Milestone: SPH23TM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Test Data for Jan-Mar 1997 to RPC**

**Expected Date 9/30/97**

**Actual Date:**

**3: 1.2.3.3.1.3.1**

**Responsible Staff: R.P Graves**

**Milestone: SPH255M4**

**Baseline Date: 7/10/97**

**TITLE: Memo To TPO: Prov Pred Hydro Property WT-24**

**Expected Date 7/10/97**

**Actual Date: 7/10/97**

**WBS: 1.2.3.3.1.3.1**

**Responsible Staff: R.P Graves**

**Milestone: SPH37FM4**

**Baseline Date: 10/31/97**

**TITLE: Memo to TPO: Jan-Jun97 Perio Wtr Lvl Data to RPC**

**Expected Date 10/31/97**

**Actual Date:**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH23VM4**

**Baseline Date: 2/28/97**

**TITLE: Memo to TPO: Annotated Outline Site SZ Synth Rpt**

**Expected Date 2/11/97**

**Actual Date: 2/11/97**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH23WM4**

**Baseline Date: 5/30/97**

**TITLE: Memo to TPO: Rev Draft Site SZ Synthesis Report**

**Expected Date 7/7/97**

**Actual Date: 7/7/97**

## **HYDROLOGIC MODELING TEAM**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH24FM4**

**Baseline Date: 4/30/97**

**TITLE: Memo to TPO: Updated Geohydro Frmwrk Sub for Rev**

**Expected Date 4/29/97**

**Actual Date: 4/29/97**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH25CM4**

**Baseline Date: 2/28/97**

**TITLE: Memo to TPO: Summary of Meetings with PA Mdlrs**

**Expected Date 2/13/97**

**Actual Date: 2/13/97**

**3: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH25DM4**

**Baseline Date: 8/1/97**

**TITLE: Memo to TPO: Summary of Interactions with PA Mdl**

**Expected Date 7/24/97**

**Actual Date: 7/24/97**

**WBS: 1.2.3.3.1.3.3**

**Responsible Staff: P. Tucci**

**Milestone: SPH35RM4**

**Baseline Date: 7/31/97**

**TITLE: Memo to TPO: Model Input/Output Update Data**

**Expected Date 7/30/97**

**Actual Date: 7/30/97**

**WBS: 1.2.3.9.5**

**Responsible Staff: R. Spengler**

**Milestone: SPG39IM4**

**Baseline Date: 9/30/97**

**TITLE: Memo to TPO: Re-Eval Subsurf Litho Contacts at YM**

**Expected Date 9/30/97**

**Actual Date:**

## **IMPLEMENTATION TEAM**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W. Whitney**

**Milestone: SPG28AM4**

**Baseline Date: 1/17/97**

**TITLE: Memo to TPO: GM Models and Interpret. Workshop**

**Expected Date 1/13/97**

**Actual Date: 1/13/97**



**IMPLEMENTATION TEAM**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28BM4**

**Baseline Date: 2/6/97**

**TITLE: Memo to TPO: GM Modls & Interpret Wrkshp Summry**

**Expected Date 2/5/97**

**Actual Date: 2/5/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28CM4**

**Baseline Date: 4/21/97**

**TITLE: Memo to TPO: Ground Motion Feedback Workshop**

**Expected Date 4/21/97**

**Actual Date: 4/21/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28DM4**

**Baseline Date: 5/13/97**

**TITLE: Memo to TPO: GM Feedback Workshop Summary**

**Expected Date 5/13/97**

**Actual Date: 5/13/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28EM4**

**Baseline Date: 6/30/97**

**TITLE: Memo to TPO: GM Characterization Input to PSHA**

**Expected Date 7/15/97**

**Actual Date: 7/15/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28FM4**

**Baseline Date: 10/25/96**

**TITLE: Memo to TPO: SS Hazards Methodologies Wrkshop**

**Expected Date 10/24/96**

**Actual Date: 10/24/96**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28GM4**

**Baseline Date: 11/15/96**

**TITLE: Memo to TPO: SS Hazards Method. Wrkshop Summary**

**Expected Date 11/14/96**

**Actual Date: 11/14/96**

## **IMPLEMENTATION TEAM**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28HM4**

**Baseline Date: 11/27/96**

**TITLE: Memo to TPO: Seis. Src. Mdls & Proponents Wrkshop**

**Expected Date 11/26/96**

**Actual Date: 11/26/96**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28IM4**

**Baseline Date: 12/19/96**

**TITLE: Memo to TPO: SS Modls & Propnents Wrkshop Summry**

**Expected Date 12/19/96**

**Actual Date: 12/19/96**

**S: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28JM4**

**Baseline Date: 1/17/97**

**TITLE: Memo to TPO: Seismic Source Interp. Wrkshop**

**Expected Date 1/13/97**

**Actual Date: 1/13/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28KM4**

**Baseline Date: 2/4/97**

**TITLE: Memo to TPO: SS Interpretations Wrkshop Summary**

**Expected Date 2/3/97**

**Actual Date: 2/3/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28LM4**

**Baseline Date: 3/20/97**

**TITLE: Memo to TPO:Elicit of Experts Interpret Complete**

**Expected Date 3/20/97**

**Actual Date: 3/20/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28MM4**

**Baseline Date: 4/25/97**

**TITLE: Memo to TPO: Seismic Source Feedback Workshop**

**Expected Date 4/21/97**

**Actual Date: 4/21/97**

## **IMPLEMENTATION TEAM**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28NM4**

**Baseline Date: 5/19/97**

**TITLE: Memo to TPO: SS Feedback Workshop Summary**

**Expected Date 5/19/97**

**Actual Date: 5/19/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28OM4**

**Baseline Date: 6/30/97**

**TITLE: Memo to TPO: SS Characterization Input to PSHA**

**Expected Date 7/15/97**

**Actual Date: 7/15/97**

**WBS: 1.2.3.2.8.3.6**

**Responsible Staff: J.W Whitney**

**Milestone: SPG28PM4**

**Baseline Date: 7/15/97**

**TITLE: Memo to TPO: PSHA Draft Report**

**Expected Date 8/18/97**

**Actual Date: 8/18/97**

## **MANAGEMENT**

**WBS: 1.2.3.9.B**

**Responsible Staff: J.S. Stuckless**

**Milestone: SPG39AM4**

**Baseline Date: 5/29/97**

**TITLE: Memo to TPO: Regional Seismology**

**Expected Date 5/29/97**

**Actual Date: 5/29/97**

**WBS: 1.2.3.9.B**

**Responsible Staff: J.S. Stuckless**

**Milestone: SPG39BM4**

**Baseline Date: 5/29/97**

**TITLE: Memo to TPO: Regional Struct Geology & Tectonics**

**Expected Date 5/29/97**

**Actual Date: 5/29/97**

**WBS: 1.2.3.9.B**

**Responsible Staff: J.S. Stuckless**

**Milestone: SPG39CM4**

**Baseline Date: 5/29/97**

**TITLE: memo to TPO: Site Stratigraphy**

**Expected Date 5/29/97**

**Actual Date: 5/29/97**

## MANAGEMENT

WBS: 1.2.3.9.B

Responsible Staff: J.S. Stuckless

Milestone: SPG39DM4

Baseline Date: 5/29/97

TITLE: Memo to TPO: Regional Stratigraphy

Expected Date 5/29/97

Actual Date: 5/29/97

WBS: 1.2.3.9.B

Responsible Staff: J.S. Stuckless

Milestone: SPG39EM4

Baseline Date: 5/29/97

TITLE: Memo to TPO: Site Seismology

Expected Date 5/29/97

Actual Date: 5/29/97

S: 1.2.3.9.B

Responsible Staff: J.S. Stuckless

Milestone: SPG39FM4

Baseline Date: 5/29/97

TITLE: Memo to TPO: Site Struct Geology and Tectonics

Expected Date 5/29/97

Actual Date: 5/29/97

WBS: 1.2.3.9.B

Responsible Staff: W. Dudley, Jr.

Milestone: SPH391M4

Baseline Date: 12/13/96

TITLE: Memo to TPO: Detailed Content Outline

Expected Date 12/13/96

Actual Date: 12/13/96

WBS: 1.2.3.9.B

Responsible Staff: W. Dudley, Jr.

Milestone: SPH392M4

Baseline Date: 8/22/97

TITLE: Memo to TPO: Draft PISA Hydrology Chaptr Section

Expected Date 10/17/97

Actual Date:

WBS: 1.2.3.9.B

Responsible Staff: W. Dudley, Jr.

Milestone: SPH395M4

Baseline Date: 10/30/97

TITLE: Memo to TPO: Tech Data Sub for Incorp in GENISES

Expected Date 10/30/97

Actual Date:

## YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey

## MONTHLY COST/FTE REPORT

Fiscal Month/Year AUGUST 1997Date Prepared 09/16/97 11:43Page 1 of 1CURRENT MONTH ENDFISCAL YEAR

WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMULATIVE COSTS
1.2.1	29	840	0	0	0	0	181	181	99
1.2.3	1247	12959	3520	0	20	0	13048	13667	10876
1.2.5	59	312	640	0	35	0	504	504	395
1.2.8	67	613	0	0	0	0	702	702	626
1.2.9	71	840	200	0	13	0	664	664	570
1.2.12	15	168	0	0	0	0	80	80	59
1.2.15	162	1388	320	0	13	0	1722	1722	1520
TOTALS	1650	17120	4680	0	81	0	16901	17520	14145

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
		EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	
0G1CFA1	USGS Engineering Assurance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.6	36.4	28.7	0.0	98.7
1.2.1.12		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.6	36.4	28.7	0.0	98.7
*1.2.1.1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.6	36.4	28.7	0.0	98.7
**1.2.1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.6	36.4	28.7	0.0	98.7
0G311FA1	Scientific Programs Management & Integra	15.7	16.6	12.0	21.8	62.3	32.4	35.6	28.3	33.1	23.4	34.4	0.0	315.6
1.2.3.1.1		15.7	16.6	12.0	21.8	62.3	32.4	35.6	28.3	33.1	23.4	34.4	0.0	315.6
0G312FA1	Nevada Operations/Earth Science Investig	55.0	57.4	62.9	66.3	98.9	87.7	57.2	46.4	59.0	56.9	62.9	0.0	710.6
1.2.3.1.2		55.0	57.4	62.9	66.3	98.9	87.7	57.2	46.4	59.0	56.9	62.9	0.0	710.6
1.2.3.1		70.7	74.0	74.9	88.1	161.2	120.1	92.8	74.7	92.1	80.3	97.3	0.0	1026.2
0G32211FB1	Review & Revision of Lithostratigraphy B	14.1	13.4	50.3	23.9	8.6	14.0	2.4	6.6	-4.8	3.5	0.3	0.0	132.3
0G32211FB2	Stratigraphic Descriptions for WT-24 and	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.5
1.2.3.2.2.1.1		14.1	13.4	50.3	23.9	8.6	14.0	2.4	6.6	-4.8	3.8	0.5	0.0	132.8
0G32212FB2	Complete Site Area Geologic Map	36.9	24.9	34.2	12.0	21.2	50.7	18.6	25.8	52.8	21.0	26.9	0.0	325.0
0G32212FB3	Fracture Studies	6.3	16.8	14.9	12.2	9.9	9.7	10.8	5.7	10.6	13.2	19.6	0.0	129.7
0G32212FB4	Geologic Mapping of the Exploratory Stud	119.7	139.2	106.3	155.8	135.2	146.7	148.2	124.8	138.2	132.0	264.4	0.0	1610.5
1.2.3.2.2.1.2		162.9	180.9	155.4	180.0	166.3	207.1	177.6	156.3	201.6	166.2	310.9	0.0	2065.2
0G3252FB1	Evaluate Tectonic Scenarios for PA	10.6	4.1	-4.1	2.3	0.0	2.5	0.6	0.1	0.0	10.5	20.4	0.0	47.0
1.2.3.2.5.2		10.6	4.1	-4.1	2.3	0.0	2.5	0.6	0.1	0.0	10.5	20.4	0.0	47.0
0G32836FB1	Conduct Probabilistic Seismic Hazards An	88.3	62.1	54.3	46.4	36.5	3.0	53.5	47.4	3.2	29.8	86.9	0.0	511.4
1.2.3.2.8.3.6		88.3	62.1	54.3	46.4	36.5	3.0	53.5	47.4	3.2	29.8	86.9	0.0	511.4
*1.2.3.2		275.9	260.5	255.9	252.6	211.4	226.6	234.1	210.4	200.0	210.3	418.7	0.0	2756.4
0G33111FB4	Collection of Site Meteor. Data for Hydr	7.8	8.8	12.2	17.5	14.3	29.6	0.4	5.9	-0.2	2.3	-6.0	0.0	92.6
1.2.3.3.1.1.1		7.8	8.8	12.2	17.5	14.3	29.6	0.4	5.9	-0.2	2.3	-6.0	0.0	92.6
0G33112FB1	Collection of Site Streamflow Data	5.6	5.1	5.3	7.4	5.7	7.1	0.0	0.0	0.0	0.0	0.0	0.0	36.2
0G33112FB2	Collection of Site Streamflow Data	0.0	0.0	0.0	0.0	0.								

U.S. GEOLOGICAL SURVEY  
ESTIMATED COSTS FOR 10/1/96 - 08/31/97

	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
1.2.3.3.1.2.3	60.5	53.7	63.3	71.0	74.8	23.8	65.4	50.9	79.8	73.6	40.5	0.0	657.3
OG33124E96 Air-K and Hydrochemisty Test - North Ram	5.5	3.1	6.4	6.1	1.4	5.8	0.1	0.0	10.9	0.3	0.0	0.0	39.6
OG33124FA1 Support E&I Design Basis Modeling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1	4.2	0.1	0.0	8.5
OG33124FB7 Air Permeability & Hydrochem Testing ESF	46.1	40.6	40.9	68.9	62.7	21.6	-5.9	10.8	12.3	-7.7	13.9	0.0	304.2
OG33124FB8 Percolation Flux across Repository Horiz	0.0	0.0	0.0	0.0	0.0	3.9	1.8	-0.9	0.0	6.1	4.1	0.0	15.0
OG33124FBA Moisture Monitoring in the ESF	2.4	2.4	1.5	18.3	8.3	2.6	2.2	1.9	-14.2	14.9	-12.8	0.0	27.5
OG33124FBB Air-Permeability & Hydrochem Testing ESF	0.0	0.0	0.0	0.0	0.0	14.5	56.6	62.1	34.7	32.7	83.0	0.0	283.6
OG33124FBD Moisture Monitoring in the ESF	0.0	0.0	0.0	0.0	0.0	4.9	18.8	16.7	-21.8	10.3	7.0	0.0	35.9
OG33124FBF South Ramp Hydrology	0.0	0.0	0.0	0.0	0.0	44.3	18.1	80.2	20.7	-3.2	20.0	0.0	180.1
OG33124FBG PTn Lateral Diversion (Phase I)	0.0	0.0	0.0	0.0	0.0	2.0	8.5	3.9	16.5	23.4	24.7	0.0	79.0
OG33124FBH ESF Drift Scale Flux and Niche Study	0.0	0.0	0.0	0.0	0.0	2.0	10.8	8.8	32.9	21.4	15.2	0.0	91.1
1.2.3.3.1.2.4	54.0	46.1	48.8	93.3	72.4	101.6	111.0	185.6	94.1	102.4	155.2	0.0	1064.5
OG33127B96 UZ Hydrochemistry	0.0	0.0	0.0	20.0	0.0	0.4	3.1	3.6	0.0	0.2	0.0	0.0	27.3
OG33127FBA UZ Hydrochemistry	23.0	27.1	22.0	1.2	18.0	14.5	-14.3	-2.3	22.1	-1.8	0.3	0.0	109.8
OG33127FBB UZ Hydrochemistry	0.0	0.0	0.0	0.0	0.0	12.8	29.7	25.0	20.0	14.8	23.9	0.0	126.2
1.2.3.3.1.2.7	23.0	27.1	22.0	21.2	18.0	27.7	18.5	26.3	42.1	13.2	24.2	0.0	263.3
OG33128FBD Fluid Flow in Unsaturated Zone Fractured	7.6	5.3	2.9	6.0	4.8	2.0	-0.4	0.0	0.0	0.0	0.0	0.0	28.2
1.2.3.3.1.2.8	7.6	5.3	2.9	6.0	4.8	2.0	-0.4	0.0	0.0	0.0	0.0	0.0	28.2
OG33129FBG Site Unsaturated Zone Flow Model	7.8	6.4	8.3	25.5	-13.3	10.9	-0.8	7.0	-3.3	0.5	16.5	0.0	65.5
OG33129FBK Support UZ Model Expert Elicitation	0.0	21.2	6.8	8.6	7.4	3.5	3.2	0.3	0.6	0.0	0.0	0.0	51.6
1.2.3.3.1.2.9	7.8	27.6	15.1	34.1	-5.9	14.4	2.4	7.3	-2.7	0.5	16.5	0.0	117.1
OG33131FBA C-Well Complex Hydraulic & Conservative	46.5	42.2	46.6	74.2	58.5	31.3	4.0	0.3	-0.5	3.3	-3.3	0.0	303.1
OG33131FBB C-Well Complex Hydraulic & Tracer Test	0.0	0.0	0.0	0.0	0.0	22.2	49.4	52.0	52.6	82.3	30.4	0.0	288.9
OG33131FBC Water-Level Monitoring	20.7	17.8	20.5	18.2	14.3	6.2	0.8	0.0	0.0	0.0	2.4	0.0	100.9
OG33131FBD Water-Level Monitoring	0.0	0.0	0.0	0.0	0.0	6.0	12.0	8.8	4.5	15.7	7.5	0.0	54.5
OG33131FBF MT Eh and Ph Measurements	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.7	1.2	7.5	8.7	0.0	22.4
OG33131FBG Perched Water and SZ Hydrologic Testing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.9	0.0	20.9
OG33131FBH Isotopic & Hydrochem Sampling/Analysis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2	0.0	21.2
1.2.3.3.1.3.1	67.2	60.0	67.1	92.4	72.8	65.7	68.5	63.8	57.8	108.8	87.8	0.0	811.9
OG33133FB3 Site Saturated Zone Flow Model	16.5	25.9	21.8	27.0	22.2	10.3	39.3	24.0	50.5	15.7	12.5	0.0	265.7
OG33133FB4 Site Saturated Zone Synthesis Report	1.3	0.0	2.5	0.3	11.0	6.2	10.4	23.6	16.7	23.2	21.9	0.0	117.1
OG33133FB5 Conduct VA SZ Flow Model Sensitivity An	4.0	2.0	2.6	8.5	8.9	12.9	22.0	16.2	17.3	1.0	44.8	0.0	140.2
OG33133FB6 Confirm SZ Hydrologic Flow Models	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	5.2	0.0	9.1
OG33133FB7 Support SZ Model Expert Elicitation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	15.6	26.4	12.7	0.0	55.9
1.2.3.3.1.3.3	21.8	27.9	26.9	35.8	42.1	29.4	71.7	65.0	100.1	70.2	97.1	0.0	588.0
*1.2.3.3	284.4	285.2	282.6	409.5	358.8	354.3	405.8	419.7	435.0	400.0	429.3	0.0	4064.6
-OG3521FA1 Tracer Gas Support	5.7	5.1	6.0	6.8	5.4	9.5	6.4	2.9	5.8	6.1	8.4	0.0	68.1

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1.2.3.5.2.1	5.7	5.1	6.0	6.8	5.4	9.5	6.4	2.9	5.8	6.1	8.4	0.0	68.1
*1.2.3.5	5.7	5.1	6.0	6.8	5.4	9.5	6.4	2.9	5.8	6.1	8.4	0.0	68.1
OG36212FB1 Confirmatory Aquatic Investigations	0.0	2.1	6.9	7.9	3.0	4.1	7.2	0.0	19.4	2.2	16.2	0.0	69.0
1.2.3.6.2.1.2	0.0	2.1	6.9	7.9	3.0	4.1	7.2	0.0	19.4	2.2	16.2	0.0	69.0
OG36215FB2 Paleoclimate/Paleoenvironmental Synthesis	40.1	38.6	31.7	62.4	37.8	19.5	9.6	30.1	2.1	-9.0	22.7	0.0	285.6
1.2.3.6.2.1.5	40.1	38.6	31.7	62.4	37.8	19.5	9.6	30.1	2.1	-9.0	22.7	0.0	285.6
OG36221FB1 Evaluation of Paleo Ground-Water Discharge	17.4	15.4	27.9	28.8	13.0	9.9	-34.8	30.2	0.1	15.3	22.8	0.0	146.0
OG36221FB2 Geo. Fract. Fill Mater, ESF & Est Past W	57.0	39.2	87.6	70.6	85.8	107.1	10.0	7.6	12.1	1.3	6.3	0.0	484.6
5221FB3 Syn. Dist. & Anal Geochron. Age Dets Potent	0.0	0.0	0.0	0.0	0.0	24.4	66.4	73.0	49.8	67.4	49.6	0.0	330.6
1.2.3.6.2.2.1	74.4	54.6	115.5	99.4	98.8	141.4	41.6	110.8	62.0	84.0	78.7	0.0	961.2
*1.2.3.6	114.5	95.3	154.1	169.7	139.6	165.0	58.4	140.9	83.5	77.2	117.6	0.0	1315.8
OG395FB1 Update 3-D Geologic Model/Database	0.0	0.0	0.0	0.0	0.0	0.0	5.7	15.5	21.3	19.4	21.8	0.0	83.7
1.2.3.9.5	0.0	0.0	0.0	0.0	0.0	0.0	5.7	15.5	21.3	19.4	21.8	0.0	83.7
OG398FA1D Support Systems Engineering Reports & St	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
OG398FA1F Data & Del Mgt., QA Compl, Oversight Sup,	14.6	13.0	13.3	10.9	15.1	26.8	22.2	22.9	42.7	0.8	12.0	0.0	194.3
OG398FB1 Support Development of PISA Ch 2.3 (Geol	30.1	29.7	43.9	50.1	55.5	50.1	69.2	69.3	48.1	49.6	31.5	0.0	527.1
OG398FB1C Provide Support to LA Plan	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
OG398FB1E Provide Input to SC Progress Report 16	9.9	11.0	10.9	5.6	13.1	9.1	9.5	10.0	11.2	-2.1	0.0	0.0	88.2
OG398FB2 Develop PISA Chapter 2.4 (Hydrology)	11.6	12.5	33.0	31.0	43.5	54.0	54.8	68.4	81.8	59.6	48.6	0.0	498.8
OG398FB2E Provide Input to SC Progress Report 17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	9.1	0.0	19.1
OG398FB4 Dev Climate/Meteorologic Sys Desc (PISA	0.0	0.0	0.0	0.0	0.0	16.1	51.3	35.3	31.0	49.3	52.3	0.0	235.3
1.2.3.9.11	66.2	66.2	101.1	97.6	127.2	156.1	207.0	205.9	214.8	167.2	153.5	0.0	1562.8
*1.2.3.9	66.2	66.2	101.1	97.6	127.2	156.1	212.7	221.4	236.1	186.6	175.3	0.0	1646.5
**1.2.3	817.4	786.3	874.6	1024.3	1003.6	1031.6	1010.2	1070.0	1052.5	960.5	1246.6	0.0	10877.6
OG535FA1 Provide FY97 Technical Data Base Input	21.3	18.0	18.0	40.7	25.5	29.9	30.5	38.0	28.9	34.5	52.7	0.0	338.0
1.2.5.3.5	21.3	18.0	18.0	40.7	25.5	29.9	30.5	38.0	28.9	34.5	52.7	0.0	338.0
1.2.5.3	21.3	18.0	18.0	40.7	25.5	29.9	30.5	38.0	28.9	34.5	52.7	0.0	338.0
OG541FA2 Viability Assessment Scenarios Developme	0.0	0.0	0.0	3.5	0.0	0.0	-0.1	1.3	0.0	0.0	0.0	0.0	4.7
1.2.5.4.1	0.0	0.0	0.0	3.5	0.0	0.0	-0.1	1.3	0.0	0.0	0.0	0.0	4.7
OG544FA1 UZ Flow Model Abstractions for VA	0.0	0.0	5.5	1.3	5.2	8.3	0.0	5.3	1.6	0.0	4.2	0.0	31.4
OG544FA2 SZ Flow Model Abstractions for VA	0.0	0.0	7.1	-0.4	-0.4	1.6	5.2	4.8	0.6	0.0	2.5	0.0	21.0
1.2.5.4.4	0.0	0.0	12.6	0.9	4.8	9.9	5.2	10.1	2.2	0.0	6.7	0.0	52.4
*1.2.5.4	0.0	0.0	12.6	4.4	4.8	9.9	5.1	11.4	2.2	0.0	6.7	0.0	57.1
**1.2.5	21.3	18.0	30.6	45.1	30.3	39.8	35.6	49.4	31.1	34.5	59.4	0.0	395.1
OG825FA1 Federal Occupation Safety & Health	8.8	7.1	9.0	8.9	7.3	7.4	7.0	11.9	7.5	9.2	7.7	0.0	91.8
1.2.8.2.5	8.8	7.1	9.0	8.9	7.3	7.4	7.0	11.9	7.5	9.2	7.7	0.0	91.8
*1.2.8.2	8.8	7.1	9.0	8.9	7.3	7.4	7.0	11.9	7.5	9.2	7.7	0.0	91.8



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OG845FA1 Radiation Protection	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-0.4	0.0	0.2
1.2.8.4.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.4	-0.4	0.0	0.2
OG847FA1 Water Resources Envir Impact Stmt Suppor	0.0	0.0	0.0	0.0	2.4	2.8	0.0	0.2	0.0	0.0	0.0	0.0	5.4
OG847FA2 Rad Water Quality Sample Collection	0.0	0.0	0.0	0.0	0.0	49.3	3.8	0.0	11.9	70.0	14.6	0.0	149.6
OG847FB1 Water Resources	30.4	29.6	30.3	48.3	17.0	37.6	32.8	36.7	31.5	39.7	45.0	0.0	378.9
1.2.8.4.7	30.4	29.6	30.3	48.3	19.4	89.7	36.6	36.9	43.4	109.7	59.6	0.0	533.9
*1.2.8.4	30.4	29.6	30.4	48.3	19.4	89.7	36.6	36.9	43.5	110.1	59.2	0.0	534.1
1.2.8	39.2	36.7	39.4	57.2	26.7	97.1	43.6	48.8	51.0	119.3	66.9	0.0	625.9
12FA1 Participant Technical Project Office	25.0	23.2	27.3	25.9	29.0	22.2	24.1	42.8	25.4	45.6	44.0	0.0	334.5
1.2.9.1.2	25.0	23.2	27.3	25.9	29.0	22.2	24.1	42.8	25.4	45.6	44.0	0.0	334.5
*1.2.9.1	25.0	23.2	27.3	25.9	29.0	22.2	24.1	42.8	25.4	45.6	44.0	0.0	334.5
OG922FA1 Participant Project Control - USGS	21.4	18.6	18.1	20.5	17.5	19.9	34.8	12.5	20.2	24.7	26.8	0.0	235.0
1.2.9.2.2	21.4	18.6	18.1	20.5	17.5	19.9	34.8	12.5	20.2	24.7	26.8	0.0	235.0
*1.2.9.2	21.4	18.6	18.1	20.5	17.5	19.9	34.8	12.5	20.2	24.7	26.8	0.0	235.0
**1.2.9	46.4	41.8	45.4	46.4	46.5	42.1	58.9	55.3	45.6	70.3	70.8	0.0	569.5
OGC522FA1 Satellite Records Operations	3.8	3.5	4.7	4.2	4.2	3.9	4.0	4.8	4.2	6.4	15.2	0.0	58.9
1.2.12.5.2.2	3.8	3.5	4.7	4.2	4.2	3.9	4.0	4.8	4.2	6.4	15.2	0.0	58.9
*1.2.12.5	3.8	3.5	4.7	4.2	4.2	3.9	4.0	4.8	4.2	6.4	15.2	0.0	58.9
**1.2.12	3.8	3.5	4.7	4.2	4.2	3.9	4.0	4.8	4.2	6.4	15.2	0.0	58.9
OGF23FA1 Support/Personnel Services	32.4	28.7	35.4	25.6	22.5	27.7	25.9	35.2	29.9	42.9	49.0	0.0	355.2
OGF23FA2 Facilities Management - Space	61.7	61.7	61.7	61.7	61.7	61.7	64.0	59.3	61.7	61.7	61.7	0.0	678.6
OGF23FA3 Facilities Management - Computers/Phones	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	0.0	183.7
OGF23FA4 Facilities Management - Other	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	0.0	137.5
OGF23FA5 Procurement/Property Management - USGS	10.2	11.0	8.0	7.3	11.5	9.9	8.5	9.9	9.2	7.1	7.2	0.0	99.8
1.2.15.2.3	133.5	130.6	134.3	123.8	124.9	128.5	127.6	133.6	130.0	140.9	147.1	0.0	1454.8
1.2.15.2	133.5	130.6	134.3	123.8	124.9	128.5	127.6	133.6	130.0	140.9	147.1	0.0	1454.8
UGF3FA1 USGS Training Support	4.5	4.2	3.7	4.8	4.2	4.2	3.8	4.6	6.5	9.9	15.1	0.0	65.5
1.2.15.3	4.5	4.2	3.7	4.8	4.2	4.2	3.8	4.6	6.5	9.9	15.1	0.0	65.5
*1.2.15.3	4.5	4.2	3.7	4.8	4.2	4.2	3.8	4.6	6.5	9.9	15.1	0.0	65.5
**1.2.15	138.0	134.8	138.0	128.6	129.1	132.7	131.4	138.2	136.5	150.8	162.2	0.0	1520.3
1.2 OPERATING	1066.1	1021.1	1132.7	1305.8	1240.4	1347.2	1283.7	1366.5	1354.5	1378.2	1649.8	0.0	14146.0
CAPITAL EQUIPMENT	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
GRAND TOTAL	1066.1	1021.1	1132.7	1305.8	1240.4	1347.2	1283.7	1366.5	1354.5	1378.2	1649.8	0.0	14146.0
FTEs													
FEDERAL	112.7	108.9	108.0	109.3	99.7	109.6	112.6	113.0	106.9	115.8	100.3	0.0	
CONTRACT	17.0	17.8	19.2	26.5	22.1	25.9	29.0	29.6	27.8	27.7	26.8	0.0	
TOTAL	129.7	126.7	127.2	135.8	121.8	135.5	141.6	142.6	134.7	143.5	127.1	0.0	

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