



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 02 1998


OVERNIGHT MAIL

Sandra L. Wastler
High Level Waste & Uranium Recovery
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
2 White Flint North
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 1988.

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


Stephan Brocoun
Assistant Manager for Licensing

OL&RC:AVG-2795

Enclosure:
Ltr, 09/14/98, Craig to Kozai, w/encl.

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cc w/encl:

L. H. Barrett, DOE/HQ (RW-1) FORS
A. B. Brownstein, DOE/HQ (RW-52) FORS
C. E. Einberg, DOE/HQ (RW-52) FORS
S. H. Hanauer, DOE/HQ (RW-2) FORS
R. A. Milner, DOE/HQ (RW-2) FORS
Samuel Rousso, DOE/HQ (RW-50) FORS
N. H. Slater, DOE/HQ (RW-52) FORS
Steve Kraft, NEI, Washington, DC
Richard Major, ACNW, Washington, DC
B. J. Garrick, ACNW, Washington, DC
W. D. Barnard, NWTRB, Arlington, VA
J. K. Kessler, EPRI, Palo Alto, CA
R. R. Loux, State of Nevada, Carson City, NV
John Meder, State of Nevada, Carson City, NV
Jim Regan, Churchill County, Fallon, NV
D. A. Bechtel, Clark County, Las Vegas, NV
Susan Dudley, Esmeralda County, Goldfield, NV
Leonard Fiorenzi, Eureka County, Eureka, NV
B. R. Mettam, Inyo County, Independence, CA
Michael King, Inyo County, Edmonds, WA
Tammy Manzini, Lander County, Austin, NV
Eve Culverwell, Lincoln County, Caliente, NV
Jackie Wallis, Mineral County, Hawthorne, NV
L. W. Bradshaw, Nye County, Pahrump, NV
Steve Bradhurst, Nye County, Tonopah, NV
Wayne Cameron, White Pine County, Ely, NV
R. I. Holden, National Congress of American Indians,
Washington, DC
Tom Burton, Nevada Indian Environmental Coalition,
Reno, NV
K. L. Ashe, M&O, Las Vegas, NV
M. A. Lugo, M&O, Las Vegas, NV
E. F. O'Neill, M&O, Las Vegas, NV
C. M. Newbury, DOE/YMSCO, Las Vegas, NV
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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:

INFORMATION ONLY

September 14, 1998

Wayne Kozai
Yucca Mountain Site Characterization
Project Office
U. S. Department of Energy
P.O. Box 30307
Las Vegas, Nevada 89036-0307

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)
Progress Report, August, 1998

Attached is the USGS progress report in the required format for the month of August, 1998.

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

Sincerely,

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

Enclosure:

cc: S. Hanauer, DOE/Forrestal
R. Dyer, DOE, Las Vegas
C. Fox, DOE, Las Vegas
A. Gil, DOE, Las Vegas
T. Gunter, DOE, Las Vegas
S. Jones, DOE, Las Vegas
S. Morris, DOE, Las Vegas
R. Patterson, 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)
R. Wallace, USGS, Reston
K. Ashe, M&O/Duke, Las Vegas
P. Burke, M&O/TRW, Las Vegas
N. Biggar, M&O/Woodward & Clyde, Las Vegas
L. Hayes, M&O/TRW, Las Vegas
C. Lugo, M&O/SAIC, Las Vegas
R. Craig, USGS, Las Vegas
M. Chornack, USGS, Denver
L. Ducret, USGS, Denver
W. Dudley, USGS, Denver
D. Edwards, USGS, Las Vegas
D. Gillies, USGS, Denver
D. Hoxie, USGS, Las Vegas
C. Hunter, USGS, Denver
R. Keefer, USGS, Denver
B. Parks, USGS, Denver
Z. Peterman, USGS, Denver
W. Scott, USGS, Las Vegas
R. Arnold, USGS, Denver
D. Soeder, USGS, Las Vegas
A. Whiteside, SAIC, Denver

U. S. GEOLOGICAL SURVEY EXECUTIVE SUMMARY

August, 1998

COORDINATION AND PLANNING

The U.S. Geological Survey-Yucca Mountain Branch currently is processing some 89 documents prepared by USGS authors. Of these listed items, 19 are USGS reports, one report is at the printers. 26 are Records Packages, five are journal articles and abstracts, and 38 represent reports that have been withdrawn for various reasons (reports started without specific funding, authors no longer with the Project, no current funding, or no requirement for completion of the report). The 26 Records Packages include six submitted to the RPC during August which will be tracked until USGS is notified of receipt by the RPC.

Reports published in August:

Brocher, Thomas M., Hunter, W. Clay, and Langenheim, Victoria E., 1998, Implications of seismic reflection and potential field geophysical data on the structural framework of the Yucca Mountain—Crater Flat region, Nevada: Geological Society of America *Bulletin*, v. 110, no. 8, p. 947-971.

Dickerson, R.P., and Drake, R.M., II, 1998, Geologic map of the Paintbrush Canyon area, Yucca Mountain, Nevada: U.S. Geological Survey *Open-File Report* 97-783, scale 1:12,000.

GEOLOGY

Geologic Framework

Preparation of cross sections, subsurface geologic structure maps, and text for the 1:50,000-scale geologic map compilation for the Saturated-Zone (SZ) Site Area is nearing completion. The report is expected to be submitted for technical review in October, 1998. Project staff provided digital mapping and GIS support for geologic input to the regional SZ modeling effort, and also participated in planning for the geologic support to the Death Valley regional saturated-zone modeling activity. Work continued on digitizing Quaternary map units within the SZ Site Area. The fracture data collected at Busted Butte were processed for submittal to the Technical Data Base. The purpose of these data is to characterize the geometry and spacing of joints in outcrops proximal to faults along a portion of a splay associated with the Paintbrush Canyon fault zone.

A milestone report (SPG167M4) titled A Detailed Characterization of Borehole Video Logs from the Drift-Scale Thermal Test Facility within Exploratory Test Facility at Yucca Mountain, Nevada, was completed. This report provides a compilation of lithostratigraphic and structural data that was collected from 26 borehole video recordings in the Thermal Test Facility (TTF) of the ESF. Approximately 3.5 km of small-diameter borings were made at the TTF, most of which have video tape recordings. It is estimated that the total amount and type of geologic data collected is equivalent to about 43 percent of that collected in the main drifts of the ESF, based on linear footage. The linear footage examined in the 26 boreholes constitutes about 11 percent of the total length of the ESF. Five lithostratigraphic zones and subzones of the Topopah Spring Tuff are represented: the upper lithophysal zone (Ttpul) and four subzones of the middle nonlithophysal zone (Ttpmn). Fracture abundances indicate a range of 1.3 to 5.5 total fractures per linear foot; average for all 26 boreholes is 2.7 fractures per foot.

Worksheets and workbooks, developed in Microsoft Excel, were used to determine fracture abundances and general orientation data from the video recordings. Each workbook consists of two worksheets: Fracture Count and XYZ Location. Both can be printed in landscape or portrait format. Fracture data were counted in 1-foot-long increments along the boreholes, and lithostratigraphic data were collected where noticeable lithologic changes occur.

Technical review of the geology in borehole WT-24 was completed. The review included examination of cuttings and cores, to a depth of 2,520 feet, at the Hydrologic Research Facility and the Sample Management Facility.

Mapping in the ECRB cross drift included: (1) full-periphery geologic mapping was completed to station 16+00, (2) detailed line surveys were completed along the left wall springline to station 16+30, (3) TQD was completed to station 15+90, and (4) Q and RMR assessments were completed to station 14+90.

Seismotectonic Studies

The published report titled *Implications of Seismic Reflection and Field Geophysical Data on the Structural Framework of the Yucca Mountain -Crater Flat Region, Nevada* (Geological Society of America Bulletin, v. 110, p. 947-971) presents data that are interpreted to provide evidence against proposed active detachment faults at shallow depth along the pre-Tertiary - Tertiary contact beneath Yucca Mountain. Rather, the seismic reflection and gravity profiles, combined with geologic data, show that this contact is offset by moderate- to high-angle faults. Beneath adjacent Crater Flat, the base of the seismogenic crust at 12 km depth is close to the top of the reflection (ductile) lower crust at 14-15 km depth, where brittle fault motions in the upper crust may be converted to pure shear in the ductile lower crust. Thus, the preferred interpretation of the geophysical data is that moderate- to high-angle faults extend to 12 to 15-km-depth beneath Yucca Mountain and Crater Flat, with only modest changes in dip.

Project staff continued review and the processing of several existing papers related to tectonic and seismicity studies at Yucca Mountain intended for publication by the USGS.

HYDROLOGY

Regional Hydrology

Staff continued routine maintenance of stream gages on Fortymile Wash and upper and lower Split and Pagany Washes on Yucca Mountain. Project staff also kept vigilance during the reporting period for potential precipitation and runoff associated with storms that passed through southern Nevada. Runoff was neither observed nor reported for the Yucca Mountain area. Work continued on a draft USGS Fact Sheet documenting the February runoff in and near the Yucca Mountain region. All estimates of peak flow associated with the February runoff have been reviewed by the Nevada District Flood Specialist.

Unsaturated-Zone Hydrology

Several efforts continued in regard to borehole data. Staff discussed sources of fracture-frequency data and conflicting DTN numbers listed in the North Ramp Report for UZ-14 and SD-9. The fracture data used in SD-9 were determined to be fully qualified SMF data. The fracture data from UZ-14 were determined to be fully qualified SMF data except for the 700—850-ft interval which was not qualified. The illustration in the report was modified, and qualified Sandia data were used in that interval. Minor changes were made in fracture-frequency data illustrations for NRG-7a and NRG#5. Work continued on data checks and revisions to F. Thamir's report titled *Drilling, logging, and testing information from borehole USW UZ-14, Yucca Mountain, Nevada*. Staff worked on a review of technical procedures for gas handling by Scott's Specialty Gases and submitted an evaluation to close NCR USGS-98-0010.

Borehole monitoring data from NRG-7a, UZ #4, UZ #6, UZ-7a, and SD-12 were transferred to Denver, converted to engineering units, and archived throughout the month. Sensor readings were checked daily for unusual occurrences. Staff addressed several document issues, including work on the WCONVERT program and procedure YAPI5.1Q and technical review and final revisions to technical procedure HP-189. Precision-resistor calibration procedures were reviewed at the Bechtel Calibration Lab at NTS, and staff worked on several problems at the borehole data-collection sites. In calibration activities, a thermistor control run was completed, and one thermistor calibration run was conducted. Work began on identification and compilation of calibration records for FY1997 that need QA review in Denver. Twenty-five trips were made to field sites for correction of generator, chiller, UPS, and data-collection problems, including 15 trips for routine generator maintenance and generator problems, and six visits to collect data or to repair data-collection systems. Three visits were made to run shelter SHPRED diagnostics. Staff assisted with logging at boreholes H-3 and H-4 and at wells in Amargosa Valley.

Efforts continued in estimation of net infiltration. Calibration of the coupled net-infiltration/surface-flow (runoff-routing) model was completed using available historic stream-flow records for gages in Yucca Wash, Drill Hole Wash, Pagany Wash, Wren Wash, and Split Wash. Results indicated some difficulties in matching observed flows due to limitations in the spatial accuracy of daily precipitation input, particularly for thunderstorms which occurred during the summer of 1984. The calibrated model includes an enhanced soil-moisture storage algorithm which allows multiple layers (including a bottom bedrock layer for shallow soils) and allows for improved modeling of surface evaporation and root-zone transpiration. Final simulations using the extracted watershed domains covering the area of the 3-D UZ flow model were conducted. A sensitivity analysis of soil depth, effective bedrock permeability, and various parameters used by the evapotranspiration (ET) module continued. Preparation of the memorandum describing updating of the net-infiltration model with the surface-runoff module continued. Based on input from paleoclimatic studies, evaluation of analog sites for developing stochastic simulations of daily precipitation for various potential future climates was completed using historic precipitation and air-temperature records available for analog sites. Modifications were made to the empirical model defining correlations between precipitation and elevation and between air temperature and elevation using results from paleoclimatic studies. Application of the coupled net-infiltration/surface-flow (runoff-routing) model to the Drill Hole Wash, Solitario Canyon, Dune Wash, Jet Ridge, and Plug Hill watershed-modeling domains using various wetter future climate analogs continued. A sensitivity analysis of the impact of air temperature on net infiltration and stream flow for potential future climates also continued, as did preparation of a memo describing work on boundary conditions of future net infiltration.

In work on estimation of percolation flux across the repository horizon, rewriting of the USGS open-file report titled *Estimates of physical properties and moisture conditions along the East-West Cross Drift alignment at Yucca Mountain, Nevada* continued. Tables of estimated physical properties including additions recommended by the USGS publications staff have been made, and graphs are being remade. Heat-dissipation (HD) probes were installed in 2-m-deep drill holes at Cross Drift Stations 5+00, 5+25, 6+50, 7+50, 7+75, 8+00, 8+25, 8+50, 8+75, 9+00, 9+25, 9+50, 9+75, 10+00, 10+25, 10+50, 10+75, 11+00, 11+25, and 11+50. Water potential was monitored in those drill holes as well as in the drill holes at Cross Drift Station 0+50 and at 25-m intervals out to Station 4+75, and in holes at similar intervals from Stations 5+50 to 7+25. Boreholes were drilled and cored to 2-m depth at Cross Drift Stations 8+50, 9+00, 9+50, 10+00, 10+50, 11+00, 11+50, and 12+00. Neutron logging was performed in 2-m boreholes at Stations 7+50, 8+00, 8+50, 9+00, 9+50, and 10+00. A monitoring station for temperature, relative humidity, and wind speed was installed at Cross Drift Station 10+03. Temperature, relative humidity, and wind-speed data were collected from monitoring stations at Cross Drift Stations 0+25, 2+37, 2+88, 3+38, and 10+03. Temperature and relative humidity data were collected from the vent line at Station 0+00 and on the TBM. Calibration equations were applied to the collected HD probe data to convert the measurements to water potentials. The resulting water potential is -0.46 bars with a standard deviation of 0.48 bars. These high measured water potentials may indicate an installation problem or a calibration problem. An alternative explanation is that the Cross Drift at Yucca Mountain is much wetter than previously estimated. Data packages are being prepared for the HD probe data and the temperature, relative humidity and wind-speed data.

Moisture monitoring in the ECRB continued during August. Eight temperature and relative humidity stations have been established in the ECRB to analyze TBM water migration. Five of those stations also measure wind speed. Some 42 HD probes have been installed in 2-m-deep holes. An HD probe was installed at Construction Station (CS) 0+50, and others are installed at additional 25-m spacing. To date, 21 HQ-size drill holes have been completed in the ECRB. One sequence of holes started at CS 0+50, and holes were drilled every 50 m. Those holes are horizontal and 2 m deep. During tunnel construction, two test zones were established to evaluate, in detail, the use of water and surfactant as a dust-control agent. All of those holes periodically are neutron logged to monitor the tunnel-wall dry-out. All available construction data have been collected and placed in a master spreadsheet. Estimates of water evaporated from the rock formation are being calculated from the neutron borehole logs, and the total evaporation out of the tunnel is being calculated from monitoring sensors. The evaporation of construction water is estimated as the difference in the total evaporation out of the tunnel and the water evaporated from the formation.

Several efforts continued in air-permeability studies. Field staff conducted hydrochemical sampling in the North

Ghost Dance Fault Alcove boreholes. Samples will be sent to the appropriate laboratories for determination of $^{13}\text{C}/^{12}\text{C}$ and for ^{14}C dating. Analysis of the Ghost Dance Fault pneumatic and tracer testing, and report preparation, continued. USGS scientists continued to use the Bureau of Reclamation fracture line-survey data to develop a discrete fracture model of the Ghost Dance fault. That discrete fracture model will provide better understanding of fracture control of tracer transport in fractured tuff.

In other moisture-related studies, all data have been collected that will be used to estimate lateral diversion in the PTn analysis. Data packages for the Alcove #3 and Alcove #4 boreholes are being reviewed. Those data will complete the data set to be used in the analysis. Unfortunately, the borehole monitoring of water potential that was originally planned was completed only on a smaller scale. Monitoring data were used to verify measurements of water potential on preserved samples (which were analyzed extensively). Analysis of the data is ongoing and will be presented using a 2-D numerical model of the PTn in the North Ramp to examine the potential for lateral diversion in that location. In work on unsaturated matrix-flow properties, all measurements of hydraulic conductivity and water retention have been completed. Numerous data packages relating to unsaturated matrix-flow properties have been completed, including general North Ramp properties, unsaturated conductivity and retention in the North Ramp, WT-24 properties and conductivity, WT-24 retention, and backfill properties, retention, and unsaturated conductivity. Additional data packages for SD-6 properties, North Ramp conductivities, as well as mineralogy, conductivity, properties, and retention for selected samples, have been compiled and are being reviewed. In experiments to characterize seepage in ESF alcoves, monitoring of temperature, relative humidity, and barometric pressure continued in selected alcoves. Data also are being collected from 78 HD probes located in Alcoves #1 and #7 and in Niche #1. Eight surface-based HD probes monitored soil water potential in and adjacent to the Ghost Dance fault. Two sets of the probes have been installed at two depths (at 10 cm and at the soil/rock contact) in the fault zone, and two sets similarly are installed away from the fault zone. The drip detection system in Alcove #7 was checked, and no drips were seen. Installation of the drip-irrigation system for the Alcove #1 seepage study was completed, and the experiment started on March 9, 1998. Water began dripping into the alcove in the first week of May. To date, approximately 63,375 gallons of water have been applied to the site. As of August 28, 1899 gallons of water had been collected from approximately 146 collection trays. Selected samples are being tested for pH, electrical conductivity, and various water-chemistry analyses. Work is underway to add a new tracer to the infiltration water and to try to determine the travel time of the water. Work also continued on estimation of drift-scale flux. Preparation of data packages continued for completed data collection in the period from February 1997 through July 1998. No drilling was completed in borehole clusters and sealed testing stations during the reporting period. Experiments in ESF alcoves continued with no changes from previous months.

Data related to the hydrologic character of surface-based boreholes have been analyzed and compiled for tables and figures to be included in the predictive evaluation due in September; preparation of the predictive report continued. An outline of the predictive report has been developed. Level 4 milestones related to the characterization of surface-based boreholes have been completed: milestone SPH236M4 [Memo to TPO: Document data package submittal] was completed on August 14, and Level 4 milestone SPH235M4 [Memo to TPO: Hydrologic property measurements] was completed on August 31.

Several aspects of isotopic work continued. In isotopic support for Thermal Testing, strontium and uranium analyses of water samples from the Drift-Scale Test and the Single-Heater Test are underway. Isotopic analysis of construction water and investigation of infiltration of construction water in the ESF-ECRB has been hindered by equipment trouble. There has been a delay in obtaining stable isotope analyses due to laboratory equipment repairs. The strontium data, however, are complete, and the data package is in preparation. Preparation and Sr analysis of SD-12 samples continued, in work on matrix water sources and fracture/matrix interaction, although much of that work will be conducted under FY1999 tasks. There will be only minimal impacts on the preliminary interpretation of Sr data to be provided for the UZ model.

Additional investigations were initiated for testing capillary barriers in work on the engineered barrier system (EBS) and backfill materials. Time-lapse photography was performed on different size fractions of crushed tuff. The data package for the investigation of backfill materials was assembled, reviewed, and submitted to the RPC/TDB, completing Level 4 milestone SPH262M4 [Memo to TPO: Backfill materials hydrologic properties data package to RPC/TDB] on August 31.

Work continued in UZ hydrochemistry using multiple methods of collection and analysis. Pore water and CO₂ were extracted from six ESF core samples by vacuum distillation. The extracted CO₂ was shipped to Beta Analytical where it will be analyzed for carbon isotopes. The extracted pore water will be analyzed in-house for tritium. Two CWAT#1 pore-water samples and eight water samples (four from WT-24, one from SD-6, and three from SD-9) were prepared for tritium analysis and counted for tritium concentration, and the data were reduced. Vacuum distillation extracted pore water from four WT-24 and four SD-6 core samples; extracted pore water will be analyzed for tritium, D/H, and ¹⁸O/¹⁶O isotopes. Pore water was collected from eight WT-24 core samples using high-pressure one-dimensional compression. That extracted pore water will be analyzed for chemistry, carbon isotopes, D/H, and ¹⁸O/¹⁶O isotopes. Pore water also was extracted from four SD-9 and two WT-24 core samples during preliminary centrifugation tests. The amount of water collected will be used to determine the extraction efficiency from low-moisture, densely welded tuff. Chemical compositions of pore water obtained by centrifuge and compression-extraction methods demonstrated no significant differences in major-ion concentrations obtained by the two methods. Four WT-24 and two SD-9 pore-water samples were analyzed for silica; two SD-6, eleven WT-24, and seven SD-9 pore-water samples were analyzed for anions; two SD-6, eight WT-24, four WT-3, and three SD-9 pore-water samples were analyzed for cations; and the alkalinity of three WT-24 and two SD-9 pore-water samples was determined by micro-titration. The data package containing analyses performed by Huffman Laboratories during FY1998 has undergone technical review and will be forwarded to the data-management group. Water extraction by compression and vacuum-distillation during August was recorded in the water-collection database. Water samples analyzed for tritium during August were recorded in the tritium database. Water samples analyzed for major ions during August were recorded in the major-ion database. Six storage cylinders were checked for leaks and heat-evacuated. The cylinders will be used to collect UZ rock-gas CO₂ from ESF boreholes. The LKB Liquid Scintillation Counter was calibrated.

In unscheduled work, staff prepared technical procedure HP-300, "Pore-water extraction using high-speed centrifugation," which is now in technical review. Support to P. Glynn (USGS) continued for preparation of the report *¹⁴C age correction on pore water at Yucca Mountain, Nevada, using the NETPATH geochemical model*. A draft paper titled *Changes in ¹⁴C activity over time during vacuum distillation of carbon from rock pore water* by G. Davidson (University of Mississippi) and I. Yang received technical review. Author and co-author are responding to reviewers' comments. The draft paper titled *¹⁴C determination by vacuum distillation and one-dimensional compression methods and tritium by enrichment on Yucca Mountain, Nevada, cores* was revised after co-author review. The paper will be sent to the YMPB reports unit for further processing. A UZ Hydrochemistry Project milestone report by Yang and others, titled *Hydrochemical investigations in characterizing the unsaturated zone at Yucca Mountain, Nevada*, was sent to the printing office for publication as USGS WRIR 98-4132.

Saturated-Zone Hydrology

Planning for the Second Tracer Complex SZ confirmation studies continued during August with a meeting on August 5 between the USGS and Nye County representatives to discuss use of FY1999 Nye County boreholes as a nucleus for the Alluvium Testing Complex. Hydraulic and tracer tests for that complex are planned for FY2000.

The partial-recirculation conservative tracer test from UE-25 c#3 to c#2, initiated on June 17 with injection of iodide and 2,4,5 trifluorobenzoic acid (TFBA), continued during August. The TFBA breakthrough curve reached a peak in June 23; the iodide peak occurred on June 25. In further testing, 2,3,4,5 tetrafluorobenzoic acid was injected into c#1 to initiate a primarily convergent tracer test from c#1 to c#2, and breakthrough of that tracer occurred in c#2 on August 17. In preliminary numbers (subject to revision), the concentration of 2,3,4,5 tetrafluorobenzoic acid has been 40 ppb through August 31.

Routine water-level measurements were conducted at boreholes UE-25 J-11 on August 3; at USW H-3 (lower interval) on August 4; at USW H-4 (lower interval) on August 5; at USW H-3 (upper and lower intervals) and USW H-5 (upper and lower intervals) on August 11; at USW H-5 (upper interval), USW WT-1, UE-25 p#1, UE-25 WT#13, and UE-25 WT#4 on August 12; at USW WT-2, UE-25 WT#16, UE-25 WT#13, and UE-25 WT#15 on August 13; and at UE-25 J-12, UE-25 J-13, and UE-25 WT#12 on August 25. Data were retrieved from USW G-2 and UE-25 WT#6 through August 31. Technical review of the water-level data package was completed. All comments were addressed, and the package was sent for QA review and submittal to the Records Center. On

August 6, annual calibration of the Mount Sopris multiconductor cable unit (s/n 1532) was performed at the Bureau of Land Management borehole south of Amargosa Valley, in preparation for FY1999 measurement activities. (That well was measured only for those calibration purposes.)

Total depth of borehole USW WT-24 remained at 2,834 ft below land surface (bls) through August 31, awaiting funds to complete the borehole into the lower volcanic aquifer. No drilling occurred during August. Additional geophysical logging will occur after completion of the borehole. Also through August 31, borehole USW SD-6 remained at about 2,541 ft bls, awaiting attempts to fish the drill bit and several joints of drill stem from the hole. No drilling or geophysical logging of SD-6 occurred during August.

After receipt from the USGS Colorado District Reports Unit and final author's review, the report *Water levels in the Yucca Mountain area, Nevada, 1996*, by R.P. Graves and approved as Open-File Report 98-169 in April 1998, was sent to the printers at the end of August.

In efforts at WT-17 toward obtaining water-table isotopic and chemical measurements, sampling was completed, and ion and isotopic analyses have been performed. Data packages are being assembled.

Geologic support continued to the Death Valley regional flow model with work on updating available reference gravity data and refining interpreted depth to the top of the basement. Processing of additional gravity data for the Amargosa region continued, with available data on basement depth being used for calibration of the gravity interpretations. Work continued on developing a U-series and thermoluminescence data base with dates for modern and paleospring discharge. Existing data are being compiled. Digitization continued of new mapping in Death Valley, and a memo outlining the status of compilation of the 1:250,000-scale geologic map of the Death Valley ground-water flow system was completed (Level 4 milestone SPDG30M4 [Memo to TPO: Progress report 1:250,000 Death Valley geologic map]). Interpretation continued of Quaternary structures and deposits in the Death Valley region. Additional development continued on an $^{40}\text{Ar}/^{39}\text{Ar}$ data base which also compiles existing data. Compilation and synthesis of geologic interpretations continued for use in geologic cross sections. Locations and profiles for each of the cross sections have been developed.

Staff continued to refine the data base to allow easier and more efficient data storage and retrieval for testing of alternate conceptual models. Work continued on the moving-window analysis to identify water-level sites that may represent perched-water conditions using an unbiased statistical approach that focuses on anomalous water levels. Detailed analyses of potentially perched water levels were conducted for the region. Database queries and GIS coverages were compiled and developed for that evaluation. Refining of the regional hydrogeologic framework model also continued, as did integration with the UGTA ground-water flow model. Modifications of MODFLOW continued in interactions with parallel programmers at ARSC. Ground-water model-evaluation runs to evaluate additional vertical discretization for the regional ground-water flow model continued. Runs of model-developing sensitivity distributions were completed. Documentation was developed for the ET data package, and image processing was completed on ET areas. Field investigations to delineate ET zones were conducted. Staff reviewed water-level data for Yucca Mountain for the period from October 1997 to June 1998. Discrepancies in regional flow-model data sets were investigated.

CLIMATE and PALEOHYDROLOGY

Stable isotope analyses of bulk-sediment samples from Owens Lake were completed. Preliminary examination of the data shows systematic changes in the stable oxygen isotope content of the sediments. Presuming the primary stable isotope signature in that data set comes from calcite precipitated in the lake, the observed changes provide a key insight into the lake's input/output hydrology as climate changed from interglacial to glacial and back to interglacial settings. As with geochemical data, the isotopic data will provide a means of characterizing the variability of the climate system during climatic change. The climatic variability is an input term for TSPA-LA.

In support of data qualification for the NRC July report, two Level 3 milestones were submitted for DOE review and acceptance on August 27 (activity 36221GB4, Data Qualification for NRC, milestone SPC26BM3 [Paleohydrology data qualification evaluation] and milestone SPC26AM3 [Paleoclimate data qualification

evaluation)).

Staff completed diatom sample analysis from Owens Lake core OL-92/2 intervals between 162.7 and 190.33 m to provide high-resolution paleoclimatic interpretations for the period 400—350 ka as future regional climate-analog scenarios at Yucca Mountain. The first stage of sample interpretation has begun. Other hydrologic and climatic data for the Owens Lake region are being assembled to develop analog models for determining precipitation and temperature changes for the past 400 ky. That activity also required identification of suitable analog sites for past-climate parameters for modeling efforts to determine future, climate-induced infiltration values at Yucca Mountain.

In work on reports, efforts continued in revision of the Climate and Past Discharge open-file report. Revision also continued of the report titled *A paleolimnologic record of climate change from Owens Lake, California, for the past 50,000 years*, by J.P. Bradbury and R. Forester, in preparation for USGS Director's approval.

SPECIAL STUDIES

Staff continued several efforts on development of the Site Description document and provided assistance in responding to geologic and geochemical questions on Natural System sections of the Site Description. Further assistance was provided on questions of citations and references. A plan was developed for integration of the geochemistry section with the geology and hydrology sections. Additional work on the Geologic System chapter focused on citations and references. Work scope and budgets were prepared for conversion of parts of the geologic site description into the working draft license application. Other activities during the report period primarily were directed at verifying and, where necessary, correcting citations in the Hydrology Chapter, as well as at obtaining copies of the more obscure references to be submitted to the TIC. The process of identifying data that have not been previously submitted to the GENISES database received only minor effort because of staff involvement in similar activities for the Viability Assessment. In work supporting the climate/meteorologic site description chapters, staff provided technical correctness review and comment resolution for the RIB report on paleoclimatic data for Yucca Mountain and responded to requests for references for the Climate site-description chapter. Staff provided support to DOE on issues related to past climate and to past glacial continental ice maps.

Work on Site Characterization Progress Report #19 began with the issuance of a guidance letter and schedule by the M&O Licensing Office on August 28. The reporting period for PR #19 is April 1, 1998 through September 30, 1998, and final input is due to the Licensing Office by October 6. Because PR #19 will be a letter-type report and contain only 10 to 15 pages of text (similar to PR #18), the document will focus on key advances achieved during the period and will be concise. Consequently, the section on Site Characterization (Section 2) will be only 3 to 4 pages in length and will describe only briefly field and lab activities that supported site characterization, including schedule changes and decision points reached. The section also will briefly discuss new site-characterization results, issues, and challenges that emerged during the period and the plans to resolve such issues. Topics for the site-characterization section are expected to be the same as in PR #18: Geology/Site Description, Altered Zone/Near-Field Environment, UZ Flow and Transport, SZ Flow and Transport, and Seismic Hazards and Design. Because the site-characterization program will be described at such a high, summary level, input from individual USGS PIs will not be sought. Instead, information recorded in USGS monthly reports to DOE will be used to identify and develop topics for PR #19, in cooperation with staff of M&O NEPO.

Parallel with the development of PR #19, the Documentation of Program Change (formerly Appendix A) will be updated and distributed as an M&O document. So far, the USGS technical lead for the SCPR has identified about 20 items in the Geohydrology and Rock Characteristics sections that need to be updated, each requiring at least a short paragraph. The USGS technical lead will work with the M&O NEPO staff to identify individuals who are in the best position to provide those updates.

WATER-RESOURCES MONITORING

Ground-water levels were measured at 35 sites in on-going monitoring, and ground-water discharge was measured at five springs and at one flowing well. Ground-water data collected during July were checked and filed. Staff

continued discussions concerning reorganization of the Nevada District with USGS-NV District managers and attended a tritium workshop at Desert Research Institute on August 25. Work on the summary monitoring report through calendar year 1997 continued. Data reviews and responses were completed, and the data-records package was submitted to USGS-ESIP for further processing. Required data-transcription checks were completed, and a modified base map was compiled for inclusion in the report. Staff completed preparation of the summary report and submitted drafts for supervisory, colleague, specialist, and editorial reviews between August 12—21.

Staff also began preparations for collection of water samples (in support of the Radiological/Environmental Field Programs) for the fourth quarter of FY1998. Final sample collection for FY1998 is scheduled for the week of September 14.

USGS Level 3 Milestone Report

October 1, 1997 - August 31, 1998

Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
PSHA Final Report Milestone Number: SP32IM3	9/25/97	2/23/98	2/23/98	
Letter Report: 4th Qtr FY 1997 Milestone Number: SSH13HM3	10/31/97	10/30/97	10/30/97	
Regional Saturated Zone Synthesis Report Milestone Number: SP23OM3R1	11/21/97	11/12/97	11/12/97	
Site Saturated-Zone Synthesis Report Milestone Number: SP23NM3R1	11/28/97	1/15/98	1/15/98	
Initiate Test of In-Situ Conditions (Alcove 7) Milestone Number: SP3507MC	12/12/97	12/9/97	12/9/97	
Deterministic Evals. For Type 1 Faults at YM Milestone Number: SPG28LM3	12/19/97	12/19/97	12/19/97	
Letter Report: 1st QTR FY 1998 Milestone Number: SSH13IM3	1/30/98	1/28/98	1/28/98	
Letter to DOE: PSHA Final Report Completed Milestone Number: SPG28MM3	2/23/98	2/23/98	2/23/98	
Letter Report: 2nd QTR FY 1998 Milestone Number: SSH13JM3	4/30/98	4/29/98	4/29/98	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Directors Approval PSHA Final Report Milestone Number: SPG28NM3	7/17/98	9/30/98		
Letter Report: 3rd QTR FY 1998 Milestone Number: SSH13KM3	7/31/98	7/31/98	7/31/98	
Paleohydrology Data Qualification Evaluation Milestone Number: SPC26BM3	8/31/98	8/27/98	8/27/98	
Paleoclimate Data Qualification Evaluation Milestone Number: SPC26AM3	8/31/98	8/27/98	8/27/98	

USGS Level 4 Milestone Report

October 1, 1997 - August 31, 1998

Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo to TPO: Draft PISA Hydrology Chaptr Section Milestone Number: SPH392M4	8/29/97	7/21/98	7/21/98	
Memo to TPO: Hydro-Property Measurements Milestone Number: SPH235M4	9/4/97	8/31/98	8/31/98	
Memo to TPO: Docmnt Data Package Submittal Milestone Number: SPH236M4	9/10/97	8/14/98	8/14/98	
Memo to TPO: Chem/Iso Anlys on Wtr Samples WT-17 Milestone Number: SPC34CM4	9/24/97	9/30/98		
Memo to TPO: Jan-Jun97 Perio Wtr Lvl Data to RPC Milestone Number: SPH37FM4	10/31/97	10/17/97	10/17/97	
Memo to TPO: Trans Frac Density Data to 3-D Mdl Milestone Number: SPG232M4	11/14/97	11/13/97	11/13/97	
Memo to TPO: Rslts of Prch Wtr Hydraul Tst WT-24 Milestone Number: SPH228M4	11/14/97	11/10/97	11/10/97	
Memo to TPO: Tech Data Sub for Incorpor in GENISES Milestone Number: SPH395M4	11/25/97	11/30/98		
Memo to TPO: ECRB Spatiotemporal Predictions Milestone Number: SPC233M4	11/28/97	11/25/97	11/25/97	
Memo to TPO: Data Pkg Struc Data/Obs to TDB Milestone Number: SPG385M4	11/28/97	5/27/98	5/27/98	
Memo to TPO: Struc Data/Interps to LANL Milestone Number: SPG395M4	12/1/97	11/25/97	11/25/97	
Memo to TPO: Eval Draft Txt SDD Hydrol Chptr. Milestone Number: SPH393M4	12/5/97	7/21/98	7/21/98	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo to TPO: Rev Draft SDD Climate Chapter Milestone Number: SPC322M4	12/9/97	1/9/98	1/9/98	
Memo to TPO: Doc Hydraul Prop. Test WT-24 Milestone Number: SPH241M4	12/19/97	4/16/99		
Memo to TPO: Raw Data to RPC Milestone Number: SPH36LM4	1/2/98	12/31/97	12/31/97	
Memo to TPO: Monitoring Data FY 1997 to RPC/TDB Milestone Number: SPH36OM4	1/2/98	12/31/97	12/31/97	
Memo to TPO: Rslts of Prch Wtr Hydr Tstng - SD-6 Milestone Number: SPH245M4	1/12/98	5/27/98	5/27/98	
Memo to TPO: Predictive Geotech. Analysis ECRB Milestone Number: SP327AM4	1/14/98	1/14/98	1/14/98	
Memo to TPO: Predictive Cross Section and Memo Milestone Number: SPG22M4	1/14/98	1/13/98	1/13/98	
Memo to TPO: Analys Condx/Properties Cross Drift Milestone Number: SPH351M4	1/15/98	1/15/98	1/15/98	
^Memo to TPO: Lithostratigraphy of WT-24 Milestone Number: SPG213M4	1/26/98	12/31/98		
Memo to TPO: Summary of Fracturing in the ESF Milestone Number: SPG242M4	1/30/98	1/30/98	1/30/98	
Memo to TPO: Geologic Map of N. of Yucca Wash Milestone Number: SPG237M4	2/2/98	1/30/98	1/30/98	
Memo to TPO: Final Rev Draft SDD Climate Chptr Milestone Number: SPC323M4	2/20/98	3/6/98	3/6/98	
Memo to TPO: Rev Drft SDD Hydro Chptr. Milestone Number: SPH394M4	2/20/98	7/21/98	7/21/98	
Memo to TPO: Frac Connectivity Data to SNL/LBL Milestone Number: SPG230M4	2/27/98	2/20/98	2/20/98	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo to TPO: Jul-Sep97 Perio Wtr Lvl Data to RPC Milestone Number: SPH37GM4	2/27/98	2/13/98	2/13/98	
Memo to TPO: Evaluation of Grid Refinement Milestone Number: SPH40EM4	2/27/98	2/27/98	2/27/98	
Memo to TPO: Hydraulic Testing BH USW WT-24 Milestone Number: SPH572M4	3/4/98	4/16/99		
Memo to TPO: Data to RPC Pmp/Monit Prch Wtr WT-24 Milestone Number: SPH242M4	3/13/98	6/16/98	6/16/98	
Memo to TPO: Analys Cond/Properties Cross Drift Milestone Number: SP33ACM4	3/27/98	10/30/98		
Memo to TPO: ECRB Spatiotemporal Predictions Milestone Number: SPC237M4	3/27/98	9/30/98		
Memo to TPO: Lithostratigraphy Log for WT-24 Milestone Number: SPG223M4	3/27/98	3/9/99		
Memo to TPO: Final Workshop Summary Milestone Number: SPG28RM4	3/27/98	4/27/98	4/27/98	
^Memo to TPO: Rslts of Sampling Completed Milestone Number: SPH232M4	3/30/98	2/19/99		
Memo to TPO: Borhle Monitoring Oct 1996-Sep 1997 Milestone Number: SPH36NM4	3/30/98	3/30/98	3/30/98	
Memo to TPO: Data Pkg of Core/Bh Data Aug-Dec 97 Milestone Number: SPH35CM4	3/31/98	3/31/98	3/31/98	
Memo to TPO: Data & Rslts Analys/Inter Sep-Dec 97 Milestone Number: SPH35DM4	3/31/98	3/31/98	3/31/98	
Memo to TPO: Data Pkg of Core/Bh Data Aug-Dec 97 Milestone Number: SPH38CM4	3/31/98	3/31/98	3/31/98	
Memo to TPO: Data&Rslts Analys/Inter Sep-Dec 97 Milestone Number: SPH38DM4	3/31/98	3/31/98	3/31/98	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo to TPO: Inventory of Hydro Data Completed Milestone Number: SPH40MM4	3/31/98	3/24/98	3/24/98	
Memo to TPO: Updated Reg Frmwrk Mdl to Rev Milestone Number: SPH40QM4	3/31/98	6/29/98	6/29/98	
Memo to TPO: Progress on Delineation of ET Area Milestone Number: SPH41GM4	3/31/98	5/29/98	5/29/98	
Memo to TPO: Doc Hydraul rop. Test SD-6 Milestone Number: SPH246M4	4/6/98	3/1/99		
Publish Sel Streamflow & Precip Data for FY97 Milestone Number: SPH36CM4	4/6/98	7/6/98	7/6/98	
Memo to TPO: Subm FY97 Data to RPC/TDB Milestone Number: SPH36DM4	4/6/98	4/3/98	4/3/98	
Memo to TPO: 1996 Water Level Data Milestone Number: SPH37HM4	4/6/98	4/3/98	4/3/98	
Memo to TPO: Data to RPC Pmp/Monit BH WT-24 Milestone Number: SPH243M4	4/14/98	9/30/99		
Memo to TPO: Data to RPC Pmp/Monit Prch Wtr SD-6 Milestone Number: SPH247M4	4/14/98	5/27/98	5/27/98	
Memo to TPO: Lithostratigraphy of SD-6 Milestone Number: SPG23AM4	4/17/98	11/13/98		
Review Draft: Conceptual Model of UZ Milestone Number: 3GUM603M	4/30/98	5/11/98	5/11/98	
Memo to TPO: Chpt 6.X of TSPA-VA Docum Milestone Number: SPH133M4	4/30/98	4/10/98	4/10/98	
Memo to TPO: Subm of Data Pkg to RPC/TDB Milestone Number: SPH258M4	4/30/98	4/30/98	4/30/98	
Memo to TPO: Subm of Data Pkg to RPC/TDB Milestone Number: SPH282M4	4/30/98	4/30/98	4/30/98	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo to TPO: Prov Analy of Pred vs Actual, WT-24 Milestone Number: SPG33UM4	5/15/98	7/1/98	7/1/98	
Memo to TPO: Hydraulic Prop. Test WT-24 Milestone Number: SPH244M4	5/20/98	1/4/00		
Memo to TPO: Updated Reg Flow Model to Rev Milestone Number: SPH40PM4	5/29/98	5/29/98	5/29/98	
Memo to TPO: Geologic Map of Sundance Fault Milestone Number: SPG238M4	6/1/98	5/29/98	5/29/98	
Memo to TPO: Review Comments for TSPA-VA Rpt Milestone Number: SPH134M4	6/5/98	6/3/98	6/3/98	
Memo to TPO: Hydraulic Testing BH USW SD-6 Milestone Number: SPH582M4	6/15/98	3/1/99		
Memo to TPO: Lithostratigraphic Log of SD-6 Milestone Number: SPG233BM4	6/19/98	1/26/99		
Memo to TPO: Conceptual Model of UZ Milestone Number: 3GUM612M	6/30/98	12/31/98		
Memo to TPO: Framework Mdl to RPC Milestone Number: SPH40SM4	6/30/98	9/30/98		
Memo to TPO: Prelim SZ Geo Map to TSPA/LA Milestone Number: SPG248M4	7/1/98	7/1/98	7/1/98	
Memo to TPO: OCT97-Mar98 Data to RPC/TDB Milestone Number: SPH36IM4	7/1/98	5/26/98	5/26/98	
Memo to TPO: Oct97-Mar98 Data to RPC/TDB Milestone Number: SPH36TM4	7/1/98	5/26/98	5/26/98	
Memo to TPO: Data to RPC Pmp/Monit BH SD-6 Milestone Number: SPH249M4	7/6/98	7/9/99		
Memo to TPO: Prov Analy Pred vs Actual, SD-6 Milestone Number: SPG33VM4	7/15/98	9/8/98		

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Memo TPO: Index Map Publ/Unpubl Geol Map Data Milestone Number: SPDG20M4	7/30/98	8/31/98		
Memo to TPO: Backfill materials hydro props rpt Milestone Number: SPH261M4	7/31/98	7/31/98	7/31/98	
Memo to TPO: Subm Data Pkg WT-24 to RPC/TDB Milestone Number: SPH573M4	7/31/98	9/30/99		
Memo to TPO: Model Input/Output Update Data Milestone Number: SPH605M4	7/31/98	7/24/98	7/24/98	
Memo to TPO: Hydraulic Properties - SD-6 Milestone Number: SPH248M4	8/14/98	10/7/99		
Memo TPO: Prog Rpt 1:250,000 DV Geol Map Milestone Number: SPDG30M4	8/31/98	8/31/98	8/31/98	
Memo to TPO: Struct Geo of Yucca Mt Milestone Number: SPG236M4	8/31/98	8/31/98	8/28/98	
Memo TPO: Bckfl matls hydro prop data pkg RPC/TDB Milestone Number: SPH262M4	8/31/98	8/31/98	8/31/98	
Memo to TPO: Rpt: Updated Reg Flow Model Milestone Number: SPH40RM4	8/31/98	9/30/98		
Memo to TPO: ET Est. Procedures & ET Ests Milestone Number: SPH41FM4	8/31/98	9/30/98		
Memo to TPO: Hydra Props of BH USW WT-24 Milestone Number: SPH574M4	8/31/98	1/4/00		
Memo to TPO: Draft Report of Findings Milestone Number: SPH606M4	8/31/98	8/24/98	8/24/98	

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

Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance														
Id	Description	Current Period					FY1998 Cumulative to Date					FY1998 at Completion		
		BCWS	BCWP	ACWP	SV	CV	BCWS	BCWP	ACWP	SV	CV	BAC	EAC	VAC
1.2.1	Systems Engineering	82	82	53	0	29	638	638	526	0	112	726	583	143
1.2.3	Site Investigations	1108	963	1475	-145	-512	11657	11085	11008	-572	77	12681	12697	-16
1.2.5	Regulatory	55	55	55	0	0	583	583	490	0	93	638	592	46
1.2.8	Environment, Safety, and H	49	49	77	0	-28	551	551	551	0	0	600	594	6
1.2.9	Project Management	57	57	101	0	-44	626	626	649	0	-23	683	732	-49
1.2.12	Information Management	6	6	5	0	1	70	70	45	0	25	77	52	25
1.2.15	Support Services	145	145	62	0	83	1596	1596	1422	0	174	1743	1595	148
Total		1502	1357	1828	-145	-471	15721	15149	14691	-572	458	17148	16845	303

Resource Distributions by Element of Cost

Fiscal Year 1998

Budgeted Cost of Work Scheduled

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	22445	22408	22390	22479	15544	15933	16774	17991	17996	17469	17197	16071	224697
LABOR	924	986	983	993	669	703	727	766	782	742	708	673	9656
SUBS	150	160	165	180	219	228	235	244	283	281	315	315	2775
TRAVEL	28	59	60	76	62	70	74	78	74	66	60	48	755
PM&E	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	228	242	260	323	290	303	285	333	529	359	419	391	3962
Total BCWS	1330	1447	1468	1572	1240	1304	1321	1421	1668	1448	1502	1427	17148

Actual Cost of Work Performed

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	19347	15629	18106	16797	14905	16396	16949	18484	14713	23465	21696	0	196487
LABOR	698	634	670	735	608	727	635	725	683	732	1045	0	7892
SUBS	190	151	226	140	242	228	268	191	315	198	218	0	2367
TRAVEL	6	27	75	31	49	38	63	59	77	40	46	0	511
PM&E	0	62	22	131	215	127	495	113	59	222	389	0	1835
OTHER	16	275	148	204	328	160	253	140	248	184	130	0	2086
Total ACWP	910	1149	1141	1241	1442	1280	1714	1228	1382	1376	1828	0	14691

WBS No. - 1.2 -Yucca Mountain Project

Resource Distributions by Element of Cost													
Fiscal Year 1998 Estimate to Complete	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	0	0	0	0	0	0	0	0	0	0	0	22044	22044
LABOR	0	0	0	0	0	0	0	0	0	0	0	1044	1044
SUBS	0	0	0	0	0	0	0	0	0	0	0	407	407
TRAVEL	0	0	0	0	0	0	0	0	0	0	0	80	80
PM&E	0	0	0	0	0	0	0	0	0	0	0	3	3
OTHER	0	0	0	0	0	0	0	0	0	0	0	620	620
Total ETC	0	0	0	0	0	0	0	0	0	0	0	2154	2154

Resource Distributions													
Fiscal Year 1998	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	1330	1447	1468	1572	1240	1304	1321	1421	1668	1448	1502	1427	17148
BCWP	1270	1404	1415	1520	1205	1357	1449	1409	1516	1247	1357	0	15149
ACWP	910	1149	1141	1241	1442	1280	1714	1228	1382	1376	1828	0	14691
ETC	0	0	0	0	0	0	0	0	0	0	0	2154	2154

	Fiscal Year Distribution												At
	Prior	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	Future	Complete
BCWS	32296	17148	9517	4027	920	279	0	0	0	0	0	0	64187
BCWP	32009	15149	0	0	0	0	0	0	0	0	0	0	
ACWP	32040	14691	0	0	0	0	0	0	0	0	0	0	
ETC	0	2154	9517	4026	920	279	0	0	0	0	0	0	63627

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 1997 - August 31, 1998

9/10/98 3:11:42 PM

		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
0G1CGA1	USGS Engineering Assurance	35.7	25.2	72.7	32.8	40.0	69.6	11.3	37.7	39.8	35.2	48.8	0.0	448.9
121C9075U1	USGS Engineering Assurance (EA)	35.7	25.2	72.7	32.8	40.0	69.6	11.3	37.7	39.8	35.2	48.8	0.0	448.9
0G1CGA2	Personnel Qualification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.4	0.0	0.0	4.0
0G1CGA2	Support to Line Org. for Ongoing Docum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	3.0	62.3	4.8	0.0	71.4
121C9075U2	Support to Line Org. for Documentatio	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	6.7	62.7	4.8	0.0	75.4
121C9075		35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	46.4	97.9	53.6	0.0	524.2
1.2.1.1		35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	46.4	97.9	53.6	0.0	524.2
1.2.1		35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	46.4	97.9	53.6	0.0	524.2
0G311GA1	Scientific Programs Management & Integ	19.7	14.8	24.4	14.1	19.8	20.2	18.9	19.2	14.6	18.4	24.6	0.0	208.7
0G312GA1	Manage Nevada Operations/Earth Scien	73.3	53.2	53.6	52.7	111.1	30.2	44.4	37.9	39.3	36.2	174.2	0.0	706.2
12319090U1	USGS SP&I	93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	53.9	54.6	198.8	0.0	914.9
12319090		93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	53.9	54.6	198.8	0.0	914.9
1.2.3.1		93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	53.9	54.6	198.8	0.0	914.9
0G32836FB1	Conduct Probabilistic Seismic Hazards A	11.5	-3.7	19.5	1.5	4.3	-2.4	11.2	-5.3	4.3	3.2	0.0	0.0	44.2
0G32836GB3	Support Seismic Design Input	18.9	22.6	6.6	27.2	17.4	18.3	2.1	23.8	15.2	0.9	7.1	0.0	160.1
12321155U1	Prepare Seismic Design Inputs	30.5	18.9	26.2	28.7	21.8	15.9	13.3	18.4	19.5	4.1	7.1	0.0	204.3
0G32836HB3	Conduct Strain Measurements	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	53.3	3.2	0.0	63.9
12321155U2	Conduct Strain Measurements	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	53.3	3.2	0.0	63.9
0G32836FB1	Conduct Probabilistic Seismic Hazards A	0.0	6.1	1.0	10.5	11.6	-9.8	27.9	3.6	7.8	-39.3	0.0	0.0	19.4
12321155UC	Conduct Prob. Seismic Hazards Ass.	0.0	6.1	1.0	10.5	11.6	-9.8	27.9	3.6	7.8	-39.3	0.0	0.0	19.4
0G32836FB1	Conduct Probabilistic Seismic Hazards A	0.0	0.0	0.0	11.2	1.2	26.8	12.3	11.0	1.8	-1.8	18.2	0.0	80.6
12321155UY	PSHA - Deferred	0.0	0.0	0.0	11.2	1.2	26.8	12.3	11.0	1.8	-1.8	18.2	0.0	80.6
12321155		30.5	25.0	27.2	50.4	34.6	32.9	53.5	33.1	36.6	16.3	28.4	0.0	368.3
0G32211GA1	Stratigraphic Support to LA & Confirmati	21.4	9.6	12.5	20.8	19.2	9.1	5.6	8.7	1.6	21.0	4.4	0.0	133.8
12322210U1	Stratigraphy	21.4	9.6	12.5	20.8	19.2	9.1	5.6	8.7	1.6	21.0	4.4	0.0	133.8
0G32212GA3	Structural Support to LA & Confirmation	0.8	0.2	4.3	-1.8	3.5	0.0	6.0	11.8	13.5	7.3	4.0	0.0	49.5
0G32212GB1	Conduct Fracture Studies	3.9	3.7	7.8	1.4	2.2	5.6	9.2	2.7	5.2	1.4	2.4	0.0	45.4
0G32212GB2	Publish Maps & Reports for Structural St	12.0	5.1	-8.5	12.2	0.8	-5.7	10.0	19.2	25.9	3.9	-2.2	0.0	72.7
0G32212GB4	Structural Support to TSPA/VA	2.1	3.1	9.3	4.0	3.2	28.6	26.8	16.3	40.4	13.5	17.3	0.0	164.6
12322210U2	Structure	18.7	12.1	12.9	15.8	9.6	28.4	52.0	50.0	84.9	26.1	21.6	0.0	332.2
0G32211GB3	Detailed Char. of BH Video Logs from Dr	1.3	8.6	-5.1	0.4	0.2	16.7	14.6	5.7	3.6	-0.2	3.6	0.0	49.4

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		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	
12322210U4	Eval. BH Video Logs - DSHT BHs	1.3	8.6	-5.1	0.4	0.2	16.7	14.6	5.7	3.6	-0.2	3.6	0.0	49.4
OG32211FB2	Stratigraphic Descriptions - WT-24/SD-6	0.0	18.5	2.6	1.4	0.5	0.7	0.4	2.4	6.7	12.0	12.2	0.0	57.5
12322210UC	Stratigraphic Descriptions - SD6/WT2	0.0	18.5	2.6	1.4	0.5	0.7	0.4	2.4	6.7	12.0	12.2	0.0	57.5
OG32211FB2	Develop Stratigraphic Description - Defer	0.0	0.0	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
12322210UW	Stratigraphic Descriptions - WT-24 De	0.0	0.0	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
12322210		41.4	48.7	26.6	38.5	29.5	55.0	72.6	66.9	96.8	58.8	41.8	0.0	576.7
OG32212FB2	Complete Site Area Geologic Map - ECR	0.0	29.6	35.7	29.7	37.9	10.4	-6.7	9.1	-0.3	1.1	-0.2	0.0	146.3
OG32212FB5	Geologic Mapping of the ECRB	55.2	69.6	46.7	71.4	59.0	63.2	120.0	106.5	117.4	96.3	117.5	0.0	923.0
OG32733FB1	Predictive Geotechnical Analysis for EC	0.6	7.5	11.6	10.3	11.5	1.8	3.5	0.0	0.0	0.0	0.0	0.0	46.9
12326050U2	Structural Features and ESF Testing	55.9	106.7	94.1	111.4	108.4	75.4	116.9	115.6	117.1	97.4	117.3	0.0	1116.1
12326050		55.9	106.7	94.1	111.4	108.4	75.4	116.9	115.6	117.1	97.4	117.3	0.0	1116.1
OG32212GB3	Structural Support to Isotopic Age Studie	3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	1.9	3.0	0.5	0.0	19.7
12327025U1	Structural Support to Isotopic Age Stud	3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	1.9	3.0	0.5	0.0	19.7
12327025		3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	1.9	3.0	0.5	0.0	19.7
1.2.3.2		131.6	181.4	148.0	202.0	173.2	168.5	243.0	217.3	252.4	175.6	188.1	0.0	2080.9
OG33133GBF	Support VA SZ Flow Model Sensitivity A	2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	6.3	7.1	0.4	0.0	38.2
12331200U1	Abs/Testing SZ Flow Model for VA	2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	6.3	7.1	0.4	0.0	38.2
12331200		2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	6.3	7.1	0.4	0.0	38.2
OG33124GB5	PTn Lateral Diversion (Phase II)	6.9	7.4	3.3	9.3	4.1	0.2	6.7	12.7	9.4	81.8	21.4	0.0	163.2
12332245U1	Hydrostratigraphy	6.9	7.4	3.3	9.3	4.1	0.2	6.7	12.7	9.4	81.8	21.4	0.0	163.2
OG33123GB4	Est. of Effective Porosity Values for Topa	0.0	0.0	4.1	0.2	-3.5	6.5	13.7	13.6	11.9	27.0	27.6	0.0	101.1
12332245U2	Surface-Based Borehole Testing	0.0	0.0	4.1	0.2	-3.5	6.5	13.7	13.6	11.9	27.0	27.6	0.0	101.1
OG33124FBB	Air-K & Hydrochemistry Testing ESF	45.0	36.6	71.8	43.8	52.1	51.2	58.7	43.8	36.3	11.3	25.9	0.0	476.4
12332245U3	ESF Borehole Testing	45.0	36.6	71.8	43.8	52.1	51.2	58.7	43.8	36.3	11.3	25.9	0.0	476.4
OG33123GB3	Unsaturated Matrix Flow Properties	6.3	17.8	0.9	11.9	12.1	21.9	12.7	1.3	0.0	9.9	0.2	0.0	95.0
OG33123GB5	Backfill Hydrologic Properties Measurem	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.5	6.8	21.4	0.0	62.7
12332245U4	Hydrologic Properties Measurements	6.3	17.8	0.9	11.9	12.1	21.9	12.7	1.3	34.5	16.8	21.6	0.0	157.7
OG33124GB7	ESF Drift-Scale Flux & Niche Study (Pha	0.0	5.5	23.5	-3.5	9.8	13.1	7.4	13.9	4.6	8.7	20.1	0.0	102.9
OG33124GBF	Characterization of Seepage in Alcoves	11.3	36.4	38.6	34.8	35.6	9.5	93.9	23.4	11.2	15.2	17.1	0.0	326.9
12332245U5	Percolation and Seepage	11.3	41.8	62.0	31.3	45.4	22.6	101.3	37.2	15.8	23.9	37.2	0.0	429.8
OG33131GB2	Hydraulic/Tracer Test of Prow Pass Tuff	20.2	7.1	10.0	5.4	11.6	39.7	39.9	32.3	54.0	41.5	40.4	0.0	301.9

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		EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	
OG33131GB4	SZ Hydraulic Testing of Borehole USW	0.0	2.4	0.3	1.8	37.1	11.6	49.2	18.9	19.1	3.3	-17.3	0.0	126.3
OG33131GB5	SZ Hydraulic Testing of Borehole USW	0.0	0.0	0.6	0.0	0.0	2.8	9.6	1.1	0.5	0.0	3.0	0.0	17.6
OG33133GA3	Planning for STC SZ Confirmation Studi	1.5	-1.2	6.4	3.4	7.5	8.6	6.3	3.6	-1.5	0.0	1.2	0.0	35.9
12332245U6	Saturated Zone Testing	21.7	8.3	17.2	10.6	56.2	62.7	104.9	55.8	72.1	44.8	27.3	0.0	481.6
OG33127GB1	Matrix Water Sources and Fract.-Matrix I	10.7	8.7	6.1	12.2	3.6	8.1	8.2	4.0	5.1	2.9	19.6	0.0	89.1
OG33127GB2	Iso./Hydrochem. Studies of UZ Water an	13.5	17.3	16.8	19.8	44.5	6.7	81.7	11.0	0.4	13.5	43.8	0.0	268.8
12332245U7	UZ Hydrochemistry	24.2	25.9	22.9	32.0	48.1	14.8	89.9	15.0	5.5	16.3	63.4	0.0	357.9
OG33123FBF	Hydrologic Charac. of SB BH - WT-24/S	0.0	0.0	11.2	3.8	4.6	13.1	-3.2	-2.6	13.4	6.6	13.6	0.0	60.6
12332245UC	Matrix Properties - SD6/WT24	0.0	0.0	11.2	3.8	4.6	13.1	-3.2	-2.6	13.4	6.6	13.6	0.0	60.6
OG33131FBG	Perched Wtr & SZ Hydrologic Tstg - WT	27.2	11.5	28.2	17.2	21.2	39.4	39.5	34.8	49.9	30.7	57.0	0.0	356.5
OG33131FBH	Iso/Hydrochem Smpg/Anal of SZs - WT	8.2	7.3	5.6	8.0	13.4	1.9	-0.3	-38.8	10.7	0.0	0.0	0.0	15.9
12332245UD	Hydrologic Tst/Hydrochem. Sampling	35.4	18.8	33.8	25.1	34.6	41.3	39.2	-4.0	60.5	30.7	57.0	0.0	372.5
OG33124FBF	Evaluate Hydrology of South Ramp (RM)	1.5	6.1	3.6	19.2	13.2	32.1	6.6	4.0	-1.2	0.0	0.6	0.0	85.7
OG33124FBG	Eval Pot Lateral Diversion of Infiltrating	0.0	0.8	0.0	0.9	17.1	12.2	22.3	7.2	22.3	0.3	0.0	0.0	83.1
12332245UR	Risk Mitigation - Hydrostratigraphy	1.5	6.9	3.6	20.0	30.3	44.3	28.9	11.1	21.1	0.3	0.7	0.0	168.8
OG33124FBH	Evaluate Drift Scale Flux in ESF Niches (7.3	2.6	-2.9	20.0	28.2	22.7	0.9	5.4	2.2	0.0	0.0	0.0	86.4
OG33124GA1	Support E&I Design Basis Modeling (RM)	0.7	-0.7	0.0	0.0	0.0	3.8	6.1	3.8	9.0	0.0	0.0	0.0	22.7
12332245US	Risk Mitigation - Percolation & Seepag	8.0	1.9	-2.9	20.0	28.2	26.5	6.9	9.3	11.2	0.0	0.0	0.0	109.1
OG33123FBF	Char. Hydr. of SB Boreholes - Deferred	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	2.3	4.3	0.0	15.3
12332245UW	Matrix Properties WT-24 Deferred	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	2.3	4.3	0.0	15.3
OG33131FBG	Conduct Perched Water & SZ Hydraulic	1.5	40.1	-16.7	4.5	60.7	0.0	1.1	0.0	0.0	-0.4	0.0	0.0	90.9
OG33131FBH	Iso/Hydrochem Smpg/Init Analyses of S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.6	-11.0	0.0	0.0	0.0	45.6
12332245UX	Hydrologic Testing/Hydrochem Sampli	1.5	40.1	-16.7	4.5	60.7	0.0	1.1	56.6	-11.0	-0.4	0.0	0.0	136.5
OG33131FBB	Conduct C-Holes Testing - Deferred	3.4	6.8	29.3	34.0	21.5	10.9	3.9	9.9	4.4	8.9	10.8	0.0	143.7
OG33131FBF	Conduct Chemical & Isotopic Analysis -	0.0	0.0	0.0	0.0	0.0	0.0	3.6	6.3	0.7	1.2	0.8	0.0	12.6
12332245UY	SZ Testing - Deferred	3.4	6.8	29.3	34.0	21.5	10.9	7.5	16.2	5.0	10.0	11.6	0.0	156.3
OG33121GB2	Update & Enhance Net Infiltration Numer	7.1	17.7	5.7	14.2	17.1	12.2	2.5	5.8	8.4	2.7	13.8	0.0	107.1
OG33121GB3	Prediction of Future Net Infil. Rates in Re	0.0	0.0	0.0	5.2	0.5	11.0	29.8	1.7	9.7	25.0	8.8	0.0	91.8
12332247U1	UZ Modeling	7.1	17.7	5.7	19.4	17.5	23.2	32.3	7.5	18.1	27.7	22.6	0.0	198.8
OG33131GBA	Reduce Uncert. in Flux Values Used to C	2.2	7.9	3.7	5.0	5.4	3.0	3.4	9.8	8.2	33.1	9.7	0.0	91.4
OG33131GBA	Oasis Valley ET - Saturated Zone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	22.5	8.2	14.8	0.0	58.5

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		EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	EST	
OG33133DV1	Geologic Support to Regional Flow Model	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	5.1	48.4	131.2	0.0	187.4
OG33133FB6	Confirm SZ Hydrologic Flow Models	14.3	20.6	21.4	20.6	22.3	-0.2	8.0	7.7	11.5	16.1	13.3	0.0	155.6
OG33133GB4	Refine Calibration of Site SZ Flow Model	8.6	7.2	9.2	10.6	13.7	22.3	10.3	11.8	1.9	3.5	8.0	0.0	107.1
OG33133GB6	Test Alternate Conceptual Models	6.1	2.9	6.6	10.7	3.1	11.0	3.7	9.2	5.9	2.9	17.7	0.0	79.7
OG33133GB7	Refine Regional Hydrogeologic Framewo	20.4	8.8	24.8	17.6	22.3	15.2	16.3	6.1	8.3	38.7	27.7	0.0	206.2
12332247U2	SZ Modeling	51.6	47.3	65.8	64.5	66.7	51.3	41.7	60.4	63.4	150.9	222.3	0.0	885.9
OG33132GB1	Iso/Hydrochem. Analysis of SZ Ground	24.9	28.2	-0.3	21.3	87.2	24.8	110.7	29.8	33.8	52.9	46.0	0.0	459.4
12332247U4	Isotopic/Hydrochemical SZ Studies	24.9	28.2	-0.3	21.3	87.2	24.8	110.7	29.8	33.8	52.9	46.0	0.0	459.4
12332245		248.7	305.7	311.8	351.8	565.8	415.3	653.2	363.7	409.6	502.9	602.6	0.0	4731.1
OG33124FB8	Percolation Flux Across Repository Horiz	0.0	26.4	24.4	68.0	36.2	-10.0	5.8	16.5	5.2	43.0	34.3	0.0	249.8
OG33124FBD	Moisture Monitoring in the ESF - ECRB	5.9	8.0	7.0	-6.3	0.9	5.2	39.5	49.3	68.8	-16.1	9.2	0.0	171.4
OG33124GBA	Infiltration of Construction Water in ESF	10.7	-3.0	0.2	15.1	6.8	1.7	13.2	4.8	2.6	6.9	13.8	0.0	72.7
12336050U3	Infiltration, Percolation & Seepage	16.6	31.3	31.6	76.7	43.9	-3.1	58.5	70.6	76.5	33.9	57.4	0.0	494.0
12336050		16.6	31.3	31.6	76.7	43.9	-3.1	58.5	70.6	76.5	33.9	57.4	0.0	494.0
OG33112FB2	Collect Site Streamflow Data (1997)	11.7	-0.7	6.2	24.8	7.4	21.2	-13.4	31.5	20.1	17.5	28.7	0.0	155.1
OG33112GB1	Collect Site Streamflow Data (1998)	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
12337025U2	Surface Water Monitoring	11.7	-0.7	6.2	24.8	7.4	21.2	-13.4	31.5	20.1	17.5	28.7	0.0	155.1
OG33123FBB	UZ Borehole Instrumentation & Monitorin	18.4	16.1	25.8	30.7	-11.7	10.3	-6.0	-0.9	0.9	0.4	0.3	0.0	84.3
OG33123FBC	Integrated Analysis & Interpretation	13.6	7.7	14.4	19.5	-13.1	13.2	0.2	-0.2	0.9	0.0	0.0	0.0	56.1
OG33123GB1	UZ Borehole Instrumentation & Monitorin	6.9	6.1	7.6	6.3	29.5	19.0	29.2	38.6	25.6	26.1	25.8	0.0	220.7
OG33123GB2	Integrated Analysis & Interpretation	0.0	0.0	0.0	5.0	3.8	-1.3	0.0	0.0	15.8	4.6	17.6	0.0	45.4
12337025U3	Surface Based Hydrologic Monitoring	38.9	29.9	47.8	61.5	8.5	41.1	23.4	37.6	43.3	31.0	43.7	0.0	406.6
OG33131FBD	Water-Level Monitoring	10.3	0.1	-1.9	0.5	4.2	9.0	8.1	0.8	1.0	0.7	1.0	0.0	34.0
OG33131GB1	Water-Level Monitoring	5.5	11.2	8.8	7.5	6.9	4.8	12.4	5.6	19.4	26.0	40.5	0.0	148.7
12337025U5	Saturated-Zone Monitoring	15.8	11.4	6.9	8.0	11.1	13.8	20.5	6.5	20.4	26.7	41.6	0.0	182.7
OG33127GB3	Isotope Support for Thermal Testing	0.0	8.0	4.4	4.9	5.3	2.2	2.2	-2.6	23.0	11.7	10.8	0.0	70.1
12337025U6	Isotope Support for Thermal Testing	0.0	8.0	4.4	4.9	5.3	2.2	2.2	-2.6	23.0	11.7	10.8	0.0	70.1
12337025		66.4	48.5	65.3	99.2	32.3	78.4	32.7	72.9	106.8	87.0	124.8	0.0	814.4
1.2.3.3		334.0	387.6	412.4	530.4	642.9	493.8	745.2	516.0	599.3	630.9	785.2	0.0	6077.6
OG36215GB2	Future 100K Climate Records	0.0	4.7	4.1	9.6	7.1	4.2	30.2	13.7	16.1	16.9	25.6	0.0	132.1
12362252U1	Paleoclimate Analysis	0.0	4.7	4.1	9.6	7.1	4.2	30.2	13.7	16.1	16.9	25.6	0.0	132.1

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	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
OG36221GB3 Water Flux Det. Thru Repos. Blk - Age,	17.4	3.8	23.8	15.2	22.5	-3.1	11.8	2.8	23.3	12.3	12.2	0.0	141.9
12362252U2 Geochronology of Fracture Minerals - L	17.4	3.8	23.8	15.2	22.5	-3.1	11.8	2.8	23.3	12.3	12.2	0.0	141.9
OG36221GB1 Paleoclimate Confirmatory Analyses - LA	11.8	9.2	-4.9	9.3	16.9	10.8	91.0	10.6	-4.7	4.6	22.4	0.0	177.1
12362252U3 Paleohydrology and WT Fluctuations	11.8	9.2	-4.9	9.3	16.9	10.8	91.0	10.6	-4.7	4.6	22.4	0.0	177.1
12362252	29.2	17.6	23.0	34.1	46.4	12.0	133.0	27.1	34.7	33.7	60.1	0.0	451.1
OG36221FB3 Syn. Distr./Anal. Geochron. Age Dets. (E	6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	25.5	31.2	51.1	0.0	356.3
12366050U1 Fracture Mineral Age Dating	6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	25.5	31.2	51.1	0.0	356.3
12366050	6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	25.5	31.2	51.1	0.0	356.3
OG36221GB4 Data Qualification for NRC	0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	2.6	15.6	6.9	0.0	33.9
12367027U2 Data Qualification Evaluation for the N	0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	2.6	15.6	6.9	0.0	33.9
12367027	0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	2.6	15.6	6.9	0.0	33.9
1.2.3.6	35.5	30.1	64.6	51.8	58.3	25.8	260.7	53.0	62.7	80.5	118.2	0.0	841.3
OG398GB6 Support PISA Geology Section	3.0	2.7	1.5	3.7	10.7	18.3	4.9	0.1	6.5	6.4	0.8	0.0	58.7
12392142U1 SDD - Geology Chapter	3.0	2.7	1.5	3.7	10.7	18.3	4.9	0.1	6.5	6.4	0.8	0.0	58.7
OG398FB2 Develop PISA Chapter 3.5 (Hydrology)	20.5	20.8	27.0	31.0	46.2	28.8	19.0	21.0	18.2	16.6	19.8	0.0	268.9
12392142U2 SDD - Hydrology Chapter	20.5	20.8	27.0	31.0	46.2	28.8	19.0	21.0	18.2	16.6	19.8	0.0	268.9
OG398FB4 Dev. Climate/Met. Site Desc.	29.5	42.0	51.5	28.4	34.7	37.8	44.4	-3.1	12.0	1.5	0.4	0.0	279.0
12392142U3 SDD - Climate/Meteorol. Chapter	29.5	42.0	51.5	28.4	34.7	37.8	44.4	-3.1	12.0	1.5	0.4	0.0	279.0
OG398GB5 Support Devel. of PISA Geochem. Sectio	12.5	7.5	5.9	-2.9	5.7	6.6	9.4	9.0	2.4	5.9	0.0	0.0	62.1
12392142U4 SDD - Geochemistry Chapter	12.5	7.5	5.9	-2.9	5.7	6.6	9.4	9.0	2.4	5.9	0.0	0.0	62.1
OG398GB6 Chapter Coord/Consol/Review	23.7	6.0	19.8	23.4	13.9	15.5	17.2	18.2	7.5	16.6	22.4	0.0	184.3
12392142U6 SDD - Coord/Consol/Review	23.7	6.0	19.8	23.4	13.9	15.5	17.2	18.2	7.5	16.6	22.4	0.0	184.3
OG32211GB4 USGS Support to 3-D Integrated Site Mo	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	11.0	6.3	7.5	0.0	33.1
12392212U1 Input to 3-D Integrated Site Model	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	11.0	6.3	7.5	0.0	33.1
OG398GA1 Support PR Input/Review	9.5	2.9	3.9	1.0	0.2	0.0	2.9	0.2	0.1	0.0	4.0	0.0	24.6
12392570U1 PR Review/Input	9.5	2.9	3.9	1.0	0.2	0.0	2.9	0.2	0.1	0.0	4.0	0.0	24.6
12392142	98.7	81.8	109.7	84.5	119.8	107.0	97.8	45.5	57.7	53.2	54.9	0.0	910.7
OG398GA1C Provide Regulatory Support	0.0	0.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	10.6	10.2	0.0	22.7
OG398GA1F Provide QA Implementation Support	9.3	11.7	27.4	13.6	10.4	46.2	-19.4	7.2	20.3	54.8	30.2	0.0	211.8
OG398GA2C Provide Support for Dev/Rev of Reg Doc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4	12.4	18.9	0.0	40.7
12399090U1 Site Investigations Support	9.3	12.3	28.8	13.6	10.4	46.2	-19.4	7.2	29.7	77.7	59.3	0.0	275.3

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	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
12399090	9.3	12.3	28.8	13.6	10.4	46.2	-19.4	7.2	29.7	77.7	59.3	0.0	275.3
1.2.3.9	108.0	94.1	138.5	98.2	130.2	153.3	78.5	52.7	87.4	130.9	114.2	0.0	1185.9
1.2.3	702.0	761.2	841.6	949.2	1135.4	891.8	1390.6	896.1	1055.7	1072.6	1404.4	0.0	11100.7
OG535GA1 Technical Data Coordination	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	51.1	44.0	40.2	0.0	414.3
12532186U1 Provide Technical Data Base Input	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	51.1	44.0	40.2	0.0	414.3
12532186	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	51.1	44.0	40.2	0.0	414.3
1.2.5.3	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	51.1	44.0	40.2	0.0	414.3
OG544GA1 Support to Performance Assessment	5.3	6.4	3.1	3.1	3.4	0.0	5.9	9.3	4.3	0.0	5.6	0.0	46.6
12541121U1 Support to Performance Assessment	5.3	6.4	3.1	3.1	3.4	0.0	5.9	9.3	4.3	0.0	5.6	0.0	46.6
OG541FA2 Deferred - Support to Performance Asse	0.0	0.0	-0.7	0.0	0.0	0.0	0.7	4.9	5.6	12.7	8.6	0.0	31.7
12541121UY Provide Support to Performance Asses	0.0	0.0	-0.7	0.0	0.0	0.0	0.7	4.9	5.6	12.7	8.6	0.0	31.7
12541121	5.3	6.4	2.4	3.1	3.4	0.0	6.6	14.2	9.9	12.7	14.2	0.0	78.3
1.2.5.4	5.3	6.4	2.4	3.1	3.4	0.0	6.6	14.2	9.9	12.7	14.2	0.0	78.3
1.2.5	38.1	32.2	43.1	29.6	46.9	33.0	39.3	58.2	61.0	56.6	54.4	0.0	492.6
OG825GA1 Safety & Health	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	9.6	9.4	15.4	0.0	97.4
12829121U1 Federal Occupational Safety & Health	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	9.6	9.4	15.4	0.0	97.4
12829121	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	9.6	9.4	15.4	0.0	97.4
1.2.8.2	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	9.6	9.4	15.4	0.0	97.4
OG847GA2 Conduct Rad Water Quality Sample Coll	15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	1.4	9.3	7.1	0.0	55.4
12842086U1 Rad Water Quality Sample Collection	15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	1.4	9.3	7.1	0.0	55.4
12842086	15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	1.4	9.3	7.1	0.0	55.4
OG847GB1 Water Resources	0.0	44.0	21.3	29.8	17.0	115.6	24.1	29.8	34.6	34.1	51.2	0.0	401.5
OG849121GA Water Appropriations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	18.3	2.4	4.5	0.0	37.2
12849121U1 Water Resources	0.0	44.0	21.3	29.8	17.0	115.6	24.1	41.8	52.8	36.5	55.7	0.0	438.7
12849121	0.0	44.0	21.3	29.8	17.0	115.6	24.1	41.8	52.8	36.5	55.7	0.0	438.7
1.2.8.4	15.7	39.5	19.9	30.5	22.8	125.0	28.3	49.7	54.3	45.7	62.8	0.0	494.1
1.2.8	24.0	45.8	28.1	38.5	29.8	132.9	35.8	59.1	63.9	55.2	78.2	0.0	591.5
OG9121GA Technical Project Office	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	14.5	23.0	40.9	0.0	359.8
12919135U1 USGS Project Management	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	14.5	23.0	40.9	0.0	359.8
12919135	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	14.5	23.0	40.9	0.0	359.8
1.2.9.1	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	14.5	23.0	40.9	0.0	359.8

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		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	
OG922GA	Participant Project Control	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	24.9	24.6	60.1	0.0	289.6
12929135U1	Project Control - USGS	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	24.9	24.6	60.1	0.0	289.6
12929135		25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	24.9	24.6	60.1	0.0	289.6
	1.2.9.2	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	24.9	24.6	60.1	0.0	289.6
	1.2.9	54.0	52.7	64.9	47.4	54.9	61.1	66.7	59.5	39.4	47.6	101.0	0.0	649.3
OGC522GA1	Satellite Records Operations	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	3.8	4.8	4.7	0.0	43.3
12C59130U1	USGS Satellite Records Operations	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	3.8	4.8	4.7	0.0	43.3
12C59130		4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	3.8	4.8	4.7	0.0	43.3
	1.2.12.5	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	3.8	4.8	4.7	0.0	43.3
	1.2.12	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	3.8	4.8	4.7	0.0	43.3
OGF23GA1	Support/Personnel Services	44.6	42.2	12.4	32.1	32.5	37.2	35.4	39.2	56.3	49.1	38.9	0.0	420.0
OGF23GA5	Procurement & Property Management	4.5	7.8	7.7	5.2	6.8	8.6	9.1	9.7	10.5	10.7	13.1	0.0	93.7
12F29110U1	Personnel/Procurement/Property Servi	49.1	49.9	20.1	37.4	39.2	45.9	44.5	49.0	66.8	59.8	52.0	0.0	513.7
OGF23GA2	Facilities Management (space)	0.0	123.3	61.7	61.7	61.7	44.7	58.8	58.8	58.8	58.8	-71.1	0.0	517.2
OGF23GA3	Facilities Management (computers/phone	0.0	36.3	18.2	18.2	18.2	13.2	17.3	17.3	17.3	17.3	47.4	0.0	220.8
OGF23GA4	Facilities Management (other)	0.0	19.7	9.8	9.8	9.8	7.3	9.4	9.4	9.4	9.4	5.2	0.0	99.3
12F29110U2	Facilities Management (USGS)	0.0	179.3	89.7	89.7	89.7	65.2	85.6	85.6	85.6	85.6	-18.5	0.0	837.3
12F29110		49.1	229.3	109.8	127.0	128.9	111.0	130.1	134.6	152.4	145.4	33.5	0.0	1351.0
	1.2.15.2	49.1	229.3	109.8	127.0	128.9	111.0	130.1	134.6	152.4	145.4	33.5	0.0	1351.0
OGF3GA1	USGS Training Support	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	4.9	5.6	27.4	0.0	71.1
12F39110U1	USGS Training Support	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	4.9	5.6	27.4	0.0	71.1
12F39110		4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	4.9	5.6	27.4	0.0	71.1
	1.2.15.3	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	4.9	5.6	27.4	0.0	71.1
	1.2.15	53.5	232.6	114.4	131.3	132.5	115.0	135.1	138.7	157.3	150.9	60.8	0.0	1422.2

U.S. GEOLOGICAL SURVEY

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	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 OPERATING	911.4	1152.8	1168.7	1232.7	1443.0	1307.2	1682.4	1255.1	1427.5	1485.7	1757.2	0.0	14823.8
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	911.4	1152.8	1168.7	1232.7	1443.0	1307.2	1682.4	1255.1	1427.5	1485.7	1757.2	0.0	14823.8
FTEs													
FEDERAL	111.7	90.6	104.7	97.4	86.4	94.9	98.4	107.2	86.9	135.9	124.2	0.0	
CONTRACT	31.5	29.4	36.1	28.3	31.4	34.7	37.7	28.3	44.6	43.2	34.0	0.0	
TOTAL	143.2	120.0	140.8	125.7	117.8	129.6	136.0	135.6	131.5	179.1	158.2	0.0	

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
Date Prepared: 9/11/98 12:40 PM

Fiscal Month/Year August 31, 1998
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CURRENT MONTH END

FISCAL YEAR

WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCONTRACT HOURS	PURCHASE COMMITMENTS	SUBCONTRACT COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.21	54	1158	253	0	20	0	728	726	524
1.23	1414	16255	3544	0	269	0	12681	13424	11146
1.25	54	472	839	0	52	0	638	683	493
1.28	78	1158	0	0	0	0	600	669	591
1.29	101	772	291	0	28	0	683	702	649
1.2.12	5	168	0	0	0	0	77	77	43
1.2.15	61	1404	378	0	26	0	1743	1743	1422
	1767	21385	5305	0	395	0	17148	18024	14868