



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

QA: N/A

MAR 26 1999

OVERNIGHT MAIL

Sandra L. Wastler
 High Level Waste & Uranium Recovery
 Division of Waste Management
 Office of Nuclear Material Safety & Safeguards
 U.S. Nuclear Regulatory Commission
 2 White Flint North
 Rockville, MD 20852

SUBMITTAL OF PARTICIPANT'S 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 participant's monthly status report on a regular basis. Enclosed is the U.S. Geological Survey Progress Report for February 1999.

If you have any questions, please contact Bertha M. Terrell at (702) 794-1348.

Stephan Brocoum
 Stephan Brocoum
 Acting Assistant Manager, Office of
 Licensing and Regulatory Compliance

OL&RC:BMT-1033

Enclosure:
 Ltr, 3/12/99, 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
N. H. Slater, DOE/HQ (RW-52) FORS
Richard Major, ACNW, Washington, DC
B. J. Garrick, ACNW, Washington, DC
J. K. Kessler, EPRI, Palo Alto, CA
Steve Kraft, NEI, Washington, DC
W. D. Barnard, NWTRB, Arlington, VA
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
Jerry McKnight, Nye County, Tonopah, NV
Debra Kolkman, 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
J. H. Smyder, Naval Reactors, Las Vegas, NV
A. V. Gil, DOE/YMSCO, Las Vegas, NV
C. M. Newbury, DOE/YMSCO, Las Vegas, NV
B. M. Terrell, 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

March 12, 1999

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, February 1999

Attached is the USGS progress report in the required format for the month of February, 1999.

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

Sincerely,

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

Enclosure:

cc: J. Bresee, DOE/OCRWM-HQ/Forrestal
S. Hanauer, DOE/Forrestal
R. Dyer, DOE, Las Vegas
D. Barr, DOE, Las Vegas
C. Fox, DOE, Las Vegas
A. Gil, DOE, Las Vegas

Enclosure

T. Gunter, 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
A. Whiteside, SAIC, Denver

U.S. GEOLOGICAL SURVEY EXECUTIVE SUMMARY

February 1999

COORDINATION and PLANNING

The U.S. Geological Survey-Yucca Mountain Project Branch continued processing of some 58 documents prepared by USGS authors. Of these listed items, 36 are USGS reports (19 concerning geological topics and 17 concerning hydrologic topics), 14 are journal articles (eight are geologic in topic and six are hydrologic), and three are abstracts for which records packages are in process. Five milestone reports also are being processed. These totals represent an increase in USGS reports and a slight decrease in journal articles relative to previous months. During February, six publications packages were sent to the Records Coordinator for transmittal to the Records Processing Center. Four of those packages were Abstracts, one was an Administrative Report, and one was an Open-File Report.

GEOLOGY

The underground mapping team continued work to complete line-survey technical reviews and full-periphery maps from the ECRB Cross-Block Drift project. Work continued on the report *Geology of the ECRB Cross Drift, Stations 0+00 to 26+81, Yucca Mountain, Nevada*. Effort also continued on detailed stratigraphic descriptions (for milestone report SPG42GM3) of lithostratigraphic units exposed in the Cross Drift. Additional cost estimates were prepared for further FY1999 (as well as outyear FY2000 and FY2001) work in mapping additional niches and alcoves in the Cross Drift and in gathering data on small-scale fractures. Staff also spent substantial time preparing for upcoming NRC Appendix 7 meetings.

Several efforts in structural studies continued during February. Staff completed responses to review comments on USGS Scientific Notebook SN-0103, "Structural Description of ESF Sampling Localities." In fault-zone work, additional staff began compiling information (working to YMP-USGS Technical Procedure HP-246, R1, "Mapping Fractures on Outcrops for Hydrologic Studies") from digital photos taken from various fault zones at the site. Collected data include description of fault core (clast size, clast type, clast sorting and angularity, clast rotation, clast vs. matrix support), and description of damaged zone (primarily changes in fracture intensity, orientation). In work on the SZ site area geologic map (in support to TSPA/VA and LA), modifications and specific citation information were added to the text that accompanies the 1:50,000-scale SZ site area geologic map, in accordance with new document guidelines. Structural staff participated in several meetings with YMPB staff to discuss specifics of the checking process and relation to interpretive geologic maps. Staff began checking references, map and text, to ensure that document guidelines are being met. In

unscheduled work, significant time was spent planning for the ^{36}Cl validation study being conducted by Z. Peterman (USGS).

HYDROLOGY

Unsaturated-Zone Hydrology

Borehole monitoring activities continued. Borehole data from USW NRG-7a, UE-25 UZ #4, and UE-25 UZ #5 were transferred to Denver, converted to engineering units, and archived throughout the month. Sensor readings were checked daily, and statistical outliers were flagged. Generator problems occurred at site #3 (NRG-7a), and air-conditioning problems occurred at site #5 (UZ #4 and #5). Thirteen trips were made to field sites for correction of generator, UPS, chiller, and data-collection problems, including eight visits for routine generator maintenance and problems. Two visits were made to collect data or to check data collection, and two visits were made for air-conditioning problems. Three Smart-UPS Model 700s were ordered to replace current systems in three of the shelters. Staff worked on development of the WCONVERT program and reviewed procedures YMP-3.03, R8 and YAP-12.3Q. Staff assisted stratigraphic studies personnel in development of EXCEL macros. The borehole monitoring staff also assisted (through the SMF) with sample collection for the Nye County Early Warning Drilling Program from January 7 through March 6.

Work on infiltration models continued. Development of the users' manual for modified INFIL code continued. The new users' manual will describe all new program options and modifications to input/output formats and variables. Work also continued on finalizing model test cases to satisfy software QA for modification of routines. Work on organizing and compiling all input/output files, model codes, and test applications onto CD-ROMs continued. Daily climate records for the western United States were updated through December 31, 1997, in work to develop composite climate-input data sets. Monthly summary statistics for daily precipitation and maximum and minimum air temperatures were compiled for 16 potential future monsoon-climate analog sites and 37 potential future pluvial-climate analog sites. Based on a combination of the length and quality of available records and the extent to which records represented the predicted future climates, a set of optimum analog sites were selected to define upper and lower bounds for each potential future climate. Records from the selected sites were extracted and re-formatted to generate net-infiltration-model input files of daily precipitation and air temperature. Calibration of the new net-infiltration model, which uses a layered root-zone system and a coupled net-infiltration/surface-water flow-routing algorithm, continued, using available stream-flow records. Work also continued on an integrated model calibration using a combination of data sets including measured water-content profiles. Development of a snow-cover module continued. New post-processing routines were developed for re-formatting and summarizing model results.

Moisture monitoring in the Cross Drift continued. Temperature, relative humidity, and wind-speed data were collected from monitoring stations at Cross Drift Stations 0+25, 2+37, 2+88, 3+38, 10+03, 21+07, and 24+75. Temperature and relative humidity data

were collected from the vent line at Cross Drift Station 0+00. Water potential in the Cross Drift was monitored with the 100 heat-dissipation (HD) probes installed in 2-m-deep holes at 25-m intervals from Cross Drift Stations 0+50 to 25+25. The measured water potentials continued to indicate that the rock mass is wetter (that is, the potentials are higher) and that the moisture is more uniformly distributed than expected. A white-paper report is being prepared in cooperation with LBNL to explain the significance and implications of the measured water potentials in the Cross Drift. That report is in LBNL hands for description of the effect of those measurements on the UZ Site-Scale Model. Water-potential data from two tensiometers installed at Cross Drift Station 23+50 were compared to the nested HD probes at the same location. The HD probe data clearly show the drying of the Cross Drift rib inward from its surface. The tensiometer installed 2 m into the rib measured a water potential of approximately -0.45 bars, in reasonable agreement with the HD probe at 2 m which showed a water potential of -0.59 bars. The tensiometer installed 0.6 m into the rib failed as expected due to the low potentials (<-0.6 bars) from drying. The HD probe installed 0.8 m into the rib measured water potentials of approximately -1.7 bars. That potential is well below the bubbling pressure of a tensiometer. These data provide further support for the high water potentials measured throughout the Cross Drift with HD probes.

Monitoring of temperature, relative humidity, and barometric pressure continued in the ESF Main Drift, in niches, and in Alcove #7. Data were collected from 51 HD probes in Alcove #7. Eight surface-based HD probes monitored soil moisture potential in and adjacent to the Ghost Dance fault. Dust samples again were collected in the Alcove #7. Some 21 HD probes monitored the rock water potential in Niche #1. Planning for the cross-drift experiment has begun. Plans are being developed for instrumentation placement and the location and number of boreholes needed. An initial draft of that plan has been submitted to the Test Coordination Office. Water applications to Alcove #1 were resumed on February 19. The entire water-collection system in the alcove has been installed and tested. To date, some 3300 gallons of water have been applied to the surface above Alcove #1. As soon as seepage begins, tracer application will start. All instrumentation has been checked, and everything seems to be working correctly.

Four ESF Monitoring data packages have been assembled and technically reviewed, including GS990108312242.001, "Moisture Monitoring in the ESF, 8/1/98 to 12/12/98;" GS990108312242.002, "Temperature, Relative Humidity, and Barometric Pressure Data for Niche 1 and 2 of the ESF from 8/1/98 to 12/12/98;" GS990108312242.003, "Water Potentials Measured with Heat Dissipation Probes in 21 Drill Holes in ESF Niche 1 from 11/4/97 to 12/12/98;" and GS990108312242.005, "Temperature, Relative Humidity, and Barometric Pressure Data for Alcove 7 of the ESF from 12/8/97 to 12/12/98." Due to changes in QA requirements for data packages, additional work continued on those packages. Data also have been collected, reviewed, and assembled for the Alcove #1 infiltration-experiment data package. Data packages GS990108312242.004, "Temperature, Relative Humidity, and Barometric Pressure Measured at Alcove 1, from 11/20/97 to 12/12/98;" and GS990108312242.006, "Pulse Flow Meter Data for the Alcove 1 Infiltration Experiment from 3/8/98 to 12/4/98;" have been technically

reviewed and submitted. Due to changing QA requirements, however, the data packages were not accepted. Work on the packages continued.

Chemical and isotopic testing continued in Drift-scale Testing. Splits of water from boreholes 60-2 and 60-3 have been submitted for strontium and uranium isotopic analyses. Sampling methods were discussed with USGS, LLNL, and LBNL on February 19 in preparation of better procedures for water sampling and field analysis. Water sampling is tentatively scheduled for late March.

Work continued on several efforts in hydrochemistry. P. Glynn (USGS) continued work on the draft report on geochemical modeling of perched-water ^{14}C ages at Yucca Mountain. Strontium-isotope analyses of USW SD-12 core samples have been completed, and the data are in the process of being checked so that data packages can be prepared. As anticipated, the filament outgasser was repaired quickly, and this allowed running samples on the solid-source mass spectrometer. Various analyses continued. Two USW WT-24 and four USW SD-6 pore-water samples were analyzed for cation concentrations. Water vapor was collected in the UZ Hydrochemistry Laboratory with a cold trap. The water will be analyzed for tritium to determine the background concentration in the laboratory. Eight SD-6 and seven WT-24 pore-water samples and one Hydrochemistry Laboratory water-vapor sample were prepared for tritium analysis and counted for tritium concentration, and the data were reduced. Pore water was centrifuged from eight SD-6 core samples for major-ion chemistry, $^{18}\text{O}/^{16}\text{O}$, and D/H stable-isotope analyses. Pore water was extracted from twelve SD-6 and four WT-24 core samples by vacuum distillation. That extracted pore water will be analyzed for tritium and/or $^{18}\text{O}/^{16}\text{O}$ and D/H isotopic information. Pore water was distilled, and dissolved CO_2 was extracted from three ESF core samples. The CO_2 will be analyzed for carbon isotopes, and the pore water will be analyzed for tritium. Eighteen SD-6 and WT-24 pore-water samples (extracted by compression, centrifugation and distillation methods, and one sample split to determine the repeatability and precision of the analysis) were prepared and delivered for D/H and $^{18}\text{O}/^{16}\text{O}$ stable isotope analysis. A data transcription check was performed for a manuscript titled *Carbon-14 activity of carbon dioxide obtained by vacuum-distillation and one-dimensional compression methods and tritium enrichment on Yucca Mountain cores, Nevada*. Several additional efforts continued with the Data Management Group regarding outstanding data-package issues. A disposition was prepared responding to a new NCR (No. USGS-99-0006) regarding the suitability for site-characterization use of USW UZ-14 core samples that had previously been labeled "limited use." An addendum was prepared and added to scientific notebook SN-0077 explaining that the necessary data from attachments from procedures HP-126 and HP-249 were recorded in the Test Summary forms included in the scientific notebook. Water samples collected by centrifuge, compression and distillation methods during February were recorded in the water collection database. The LKB Liquid Scintillation Counter was calibrated. Water samples analyzed for tritium during February were recorded in the tritium database.

Saturated-Zone Hydrology

In oversight of the Nye County Early Warning Drilling Program, USGS staff visited the drilling sites with A. Edebarh (NEPO SZ Modeling Team) on February 9 and met with N. Stellavato, T. Buqo, and P. Montazer (Nye County staff) in Las Vegas on February 10. Status of drilling and testing was discussed, as was the proposed relocation of some of the well sites scheduled for completion next year on the NTS. Hydraulic test data collected at well NC-EWDP-09S were obtained, and preliminary interpretation of the data for hydraulic parameters began. Borehole data on wells completed to date were obtained (via J. Paces, J. Stuckless, and R. Spengler). Preliminary water-level altitudes were calculated, based on data presented by Nye County to the NWTRB, and that information was forwarded for inclusion in the site SZ hydrogeologic framework model. An update on the Nye County wells was presented at the TSPA SZ Abstraction/Testing Workshop in Albuquerque on February 17 and 18. Discussions at that meeting concerned timing of delivery of Nye County well data to the SZ Modeling Team and to PA, as well as the potential Q/non-Q status of the data.

The termination of hydraulic and tracer testing in the Prow Pass Tuff at the c-hole complex occurred on February 25 when pumping from UE-25 c#2 was stopped, in a test that had begun on June 2, 1998. The status memorandum describing USGS contributions to the LANL Level 3 milestone on Prow Pass testing was submitted to the TPO on February 12 in completion of Level 4 milestone SPH401M4 [Letter to TPO: Status of Prow Pass involvement]. The USGS provided two data packages and text to the LANL report, including 2,4,5 trifluorobenzoic acid and iodide tracer concentrations and observation-well pressures and pumping and re-injection rates. The stand-alone report on hydraulic interpretations underwent technical review in February and preparation for QA review. Stand-alone text regarding tracer analysis also underwent technical review; revisions were underway in February. Also during February, preparations were made for the April Appendix 7 meetings with the NRC on c-hole results from testing of the Prow Pass Tuff.

Water-level measurements were made at several wells during February, including USW H-6 (upper and lower intervals), USW WT-7, USW WT-10, and USW VH-1 on February 2; UE-25 WT#6, UE-25 WT#16, and UE-25 WT#15 on February 3; UE-25 p#1, UE-25 WT#4, and UE-25 WT#12 on February 4; USW H-5 (upper and lower intervals) and USW H-3 (upper and lower intervals) on February 8; USW WT-2, USW H-4 (lower interval), USW WT-1 and UE-25 WT#13 on February 10; USW G-2 on February 11; USW H-1 (tubes 1, 2, 3, and 4) on February 16; UE-25 J-11 on February 17; UE-25 WT#17, UE-25 WT#3, and UE-25 J-12 on February 18; and USW WT-24 and UE-25 J-13 on February 22. The data package "First-quarter FY99 data 10/98 to 12/98" was submitted to the data-management unit on February 4. Water-level measurements collected for January and February were compiled; water-level work sheets were completed for those measurements.

Regarding saturated-zone hydraulic testing, the drilling rig has been removed from borehole USW WT-24, and testing has been terminated. The perched-water hydraulic testing report has been submitted for a second colleague review. Through February 26,

the total drilled depth of borehole USW SD-6 remained at about 2,541 ft below land surface. The M&O is currently working on a schedule to place grout and a whipstock above fill overlying the lost bit and pipe in the borehole. Once that is done, the borehole will be completed at about a 3-degree inclination from the top of the whipstock to the bottom of the borehole. The whipstock will be at approximately 2,400 ft below land surface, and the borehole will be completed to a depth of approximately 2,800 ft below land surface.

Staff of the SZ modeling group participated in the TSPA SZ Abstraction/Testing Workshop that was held on February 17 and 18 in Albuquerque. Each participant presented the status of relevant work and worked on drafting proposals for future abstractions and sensitivity analyses to be used by PA for TSPA-LA/SR. Some staff also attended a meeting of the SZ Flow and Transport Modeling Team and PA on February 16 in Albuquerque. That meeting was intended to update PA as to the status of the flow and transport process model. USGS staff provided updates concerning the latest information from the Nye County Early Warning Drilling Program.

In work on development of geologic cross sections for the Death Valley regional flow system (DVRFS) project, staff participated in meetings regarding planning cross sections and setting up contracts with General Services Administration/Anteon Corporation for outside contractors to work on cross sections and their geologic interpretation. Revision 2 of the DVRFS geologic map was compiled, and a working plot was constructed for geologists compiling cross sections. The DVRFS geologic database was enhanced, and AML programs were modified to extract and build cross section templates. Cross-section templates G-5 and G-2 were completed. Hydrogeologic section H-21, an E-W line across the Funeral Mountains and the western Amargosa Desert, was constructed, and accompanying narrative description was completed. Section H-21 and parts of section G-5 were digitized and annotated; work continued on section G-5 through Yucca Flat. Cross-section template G-8 was reconstructed to incorporate alignment modifications through Oasis Valley arising from the revised depth-to-basement map of the Oasis Valley area. A detailed geophysical data set (Hildenbrand and others, 1999) was compiled for depth to basement, and the Myjo-Coffer #1 borehole was used to provide information for cross-section construction. The regional depth-to-basement data set (Saltus and Jachens, 1995) was compiled into ARC/INFO. A basement elevation map was constructed to support delineation of basement profiles for DVRFS cross sections.

Numerous efforts again continued on development of the regional SZ model. Work on regional modeling data included revision of relational data-base structures and population methods, such as automatic updates of the DVRFS data base with NWIS data. Parts of the NWIS ACCESS data base was transformed to the fully relational DVRFS structure. Nevada and California District NWIS data bases were merged to populate the DVRFS data base. Integration of the UGTA water-chemistry data into the DVRFS data set began. Assignment of appropriate USGS site IDs to the chemical data remains a critical issue. Preparations for the steady-state model included processing of MODFLOW2000 data in ACCESS and integration of the DVRFS data base into the ARCVIEW interface. Methods for flagging water-level data were developed. In work on analysis of historical trends of

modeling data, Level 4 milestone SPH703M4 [Mid-year update on transient data] was completed on February 26. In synthesis of geologic data, data transfer from existing maps to a composite greenline mylar was completed, and work began on geologic cross sections and compilation of regional stratigraphic and structural information. A preliminary section extending from eastern Pahute Mesa into the southern Reville Range was submitted for review. Data transfer also was completed from the Pahranaagat map to the Caliente map in a break-out of Tertiary formations. Upgrades to the core area of the DVRFS 1:100,000-scale geologic map continued. Several efforts continued in GIS information exchanges, completion of digital quadrangle sheets, and conversion of the 1:50,000-scale Yucca Mountain map to ARC/INFO GIS covers. Digital files were edited for consistency with the flow-model map. Correlation of stratigraphic units was updated. Surficial units of the Las Vegas sheet were provisionally correlated with the regional hydrogeologic surficial mapping units. Additional Quaternary mapping was completed for the Beatty 1:100,000-scale sheet and will be compiled for the regional geologic map. Arrangements were made for use of Landsat thematic mapping (TM) data geo-referenced to 1:100,000-scale maps, especially for the Amargosa Desert area. High-altitude photographic materials were reviewed for use in support of primary mapping. Planning continued for a multi-day workshop on recent and ongoing geophysical and geological research in the Death Valley area to be held in April of 1999 and jointly funded by the USGS and the National Park Service. Preparations were made for acquisition of some 700 additional gravity stations from the DVRFS field area. The following report was released:

Morin, R.L., Chuchel, B.A., and Blakley, R.J., 1999, Principal facts for about 500 gravity stations in the vicinity of Amargosa Desert and Pahrump Valley, California and Nevada: U.S. Geological Survey Open-File Report 99-31, 18 p. Additional lithologic logs for existing boreholes in the northern Amargosa Desert area were compiled, with focus on examination of data from the NWIS data base. Units are being correlated to previously identified subsurface hydrogeologic units. A map of all relevant Amargosa Desert boreholes is in preparation. Work on the regional hydrogeologic framework model included development of gridded surfaces that represent the top surface of flow-model layers and a related algorithm to be used for "slicing" the framework model to provide input arrays for the steady-state flow model. In work on evaluation of uncertainty in the regional conceptual model, a progress report was written in completion of Level 4 milestone SPH729M4 [Letter to TPO: Progress on regional recharge estimates], and conversion of recharge estimates into ARCVIEW files continued. Analysis of UZ vertical travel-time maps as a possible means of model verification also continued. Staff participated in the TSPA-SZ workshop in Albuquerque. Clean-up of hydrochemical data bases continued, and a Yucca Mountain/Fortymile Wash flow path was chosen as the data set for the first flow-path model. Retrieval of hydrochemical data from the ARCVIEW data base was tested. In other hydrochemical work, staff presented papers at the LBNL symposium on "Dynamics of Fluids in Fractured Rocks" (held February 10 through 12):

Paces, J.B., and Peterman, Z., 1999, Isotope hydrology of regional flow systems in southern Nevada, *in* Proceedings of the Dynamics of Fluids in Fractured Rocks: Concepts and Recent Advances, Lawrence Berkeley National Laboratory Report 42718, p. 134—138.

The paper focused on display and interpretation of chemical and isotopic parameters in the delineation of ground-water compositional domains, including definition of the flow southward from Yucca Mountain into the Amargosa Desert by sulfate, chloride, total dissolved solids, and stable isotopes. The confluence of three flow domains is clearly shown by these methods. Future work will attempt to unravel the combination of systems at Franklin Lake Playa.

In unscheduled work, staff completed technical review of draft USGS WRIR *Analysis of water levels in Frenchman Flat and Mercury Valley, Nevada Test Site*, draft GSA Today article *Stressed rock strains ground water at Yucca Mountain, Nevada*, and a USGS abstract titled *An integrated ground-water modeling program for the Death Valley region, Nevada and California*. An abstract titled *Development of a relational hydrogeologic data base and data-analysis tool for the Death Valley regional flow system model*, for the "Geologic Research and Mapping in Death Valley Workshop" to be held in April 1999, was submitted for colleague review. Staff prepared for a briefing to the USGS Western Region staff.

CLIMATE and PALEOHYDROLOGY

Isotopic studies on dating of fracture minerals continued with LANL. A report titled *Ages and origins of calcite and opal in the Exploratory Studies Facility tunnel, Yucca Mountain, Nevada* remained in revision based on comments from co-authors and the publications specialist. The main effort is in reorganizing the structure of the report to separate presentation of data from interpretation. The revised report will be resubmitted to the Publications Unit.

In continuing work to develop uranium isotopic evolution models for fracture minerals, seven samples of pore water squeezed from nonwelded tuffs of the PTn in Alcove 3 were analyzed for uranium isotopes. Resulting $^{234}\text{U}/^{238}\text{U}$ ratios are similar to surface water or slightly higher; $^{234}\text{U}/^{238}\text{U}$ activity ratios range from about 1.5 to 2.4. Data reduction has not been finalized; the uranium isotopic compositions of these pore waters, however, are clearly elevated above the secular equilibrium values expected for the tuff itself, but nowhere nearly as elevated as fracture minerals in the underlying Topopah Spring Tuff. It is possible that the pore water may have reacted with the vitric tuff either in the ground or in the laboratory during high-pressure extraction. The uniformity of the resulting analyses and the similarity with surface water values, however, suggest that this interaction likely has been minimal. Alcove 3 is constructed in nonwelded tuffs near the top of the PTn and therefore is likely to receive percolation that rapidly passes through the welded units of the Tiva Canyon Tuff with little modification from infiltration compositions. These results are consistent with predicted values based on previously reported fracture mineral studies. In order to further understand the evolution of uranium isotopes along hydrologic flow paths, it is important to analyze pore water obtained from near the base of the PTn, as well as water centrifuged from both Tiva Canyon and Topopah Spring Tuffs.

Water from the Nye County early-warning drilling program was received for isotopic and geochemical analysis. Samples were obtained both by bailing and pumping from several sites including boreholes NC-EWDP-01D, -02D, -03D, 05S, and -09S. Water was encountered beneath the Lathrop Wells Diatomite (NC-EWDP-01D) and the Root Cast Locality (NC-EWDP-09S) at much shallower depths than was originally expected. It is unclear if the static water levels in these wells, at about 17 m at NC-EWDP-01D and about 30 m at NC-EWDP-09S, represent water associated with perched zones or with ground water connected to the regional saturated zone. After development of the wells and installation of packer systems, water samples will be taken at different depths, and the resulting chemical and isotopic compositions of samples should provide definitive information regarding the perched-water issue. If not, additional shallow wells designed to penetrate only the uppermost levels may have to be drilled. Water samples are currently being processed for uranium and strontium isotopes. Non-Q chemical information has been acquired by ICP-MS analyses; quantitative chemical analyses of those samples, however, will not be completed until technical procedures are in place and approved.

In work on climate-studies support to TSPA-LA, Level 4 milestone SPC316M4 [Climate tables for TSPA-LA] was completed and submitted to the TPO on February 9. That milestone consists of tabular information for future climate. In ongoing climate work, literature searches for other studies involving future-climate predictions continued.

SPECIAL STUDIES

In support to the Working Draft License Application, five sections of the WDLA were submitted to the M&O, including Regional Geology, Tectonic Models, Surficial Geology, Site Stratigraphy, and Site Structural Geology. Reviews were completed for the Environmental Geology/Hydrology Baseline file. All references used in the Site Description for geology and hydrology were examined and classified as Project or non-Project. The quality (Q-) status of Project work was assessed. This information and the status of references in progress was provided to the M&O.

Work finally began on writing the Unsaturated Zone Hydrology section of Chapter 3 of the Working Draft License Application (WDLA). Because text of the WDLA Site Characteristics chapter primarily is based on the Yucca Mountain Site Description (Rev. 0), YMSD Rev. 0 is the principal reference. For consistency with new document-preparation requirements, specific page, table, and figure numbers from YMSD (Rev. 0) are being cited. Other references for the WDLA include the Unsaturated-Zone Flow-Model Expert Elicitation Project; the Viability Assessment; the Repository Safety Strategy; the NRC's Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts; and the NRC's Proposed Rule for Disposal of High-Level Radioactive Wastes. In addition to other requirements, text for the WDLA also is documenting software quality assurance and the sources and quality status of all data. There was no activity on the semi-annual Progress Report during February.

WATER-RESOURCES MONITORING

In work with the rain-gage network, all data were downloaded from 17 tipping-bucket gages during the week of February 1. All stations were in good operating condition. On February 5, the gage at site 407 was vandalized, with wires to the 21X recorder cut and the gage kicked over. The gage was replaced, and the station is back in operation.

USGS Level 3 Milestone Report

October 1, 1998 - February 28, 1999

Sorted by Baseline Date

<u>Deliverable</u>	Due Date	Expected Date	Completed Date	Comments
Letter Report: 4th Qtr FY98 Milestone Number: SSH14HM3	10/30/98	10/29/98	10/29/98	
Letter Report: 1st Qtr FY99 Milestone Number: SSH14IM3	1/29/99	1/28/99	1/28/99	

USGS Level 4 Milestone Report

October 1, 1998 - February 28, 1999

Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Cross-Drift Q Stratigraphic Picks to TDB Milestone Number: SPG470M4	10/15/98	12/1/98	12/1/98	
Geologic Investigation Strategy Developed Milestone Number: SPH741M4	11/30/98	11/30/98	11/30/98	
Early Progress Model Calibration Milestone Number: SPH751M4	11/30/98	11/30/98	11/30/98	
UZ-7a & UZ-14 Draft Rpt to Tech Review Milestone Number: SPG626M4	12/2/98	12/9/98	12/9/98	
Index Map-Poten Areas Detail Geol Invest Milestone Number: SPH776M4	12/15/98	12/15/98	12/15/98	
Ist Qtr Status of Data Package Development Milestone Number: SP37A1M4	12/30/98	1/8/99	1/8/99	
Ist Qtr Status Supp Line Org Doc Issues/Backlog Milestone Number: SE9601M4	12/31/98	12/31/98	12/31/98	
Water-Level Data 4th Qtr FY98 DP to RPC/TDB Milestone Number: SPH38PM4	12/31/98	12/31/98	12/31/98	
Well Data Compiled/Analyzed Detail Geol Invest Milestone Number: SPH772M4	12/31/98	12/23/98	12/23/98	
Preliminary Maps to Hydrologists Milestone Number: SPH742M4	1/15/99	1/15/99	1/15/99	
Lithostratigraphic Contacts and Depths in WT-24 Milestone Number: SPG313M4	1/26/99	3/31/99		
HFM-Progress Report I Milestone Number: SPH730M4	1/29/99	1/29/99	1/29/99	

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Climate Tables for TSPA-LA Milestone Number: SPC316M4	2/1/99	2/19/99	2/19/99	
Status of Prow Pass Involvement Milestone Number: SPH401M4	2/12/99	2/12/99	2/12/99	
Sr Isotopic System in Pore Wtr to RPC/TDB Milestone Number: SPH514M4	2/12/99	3/26/99		
ESF Monitoring Data Pkg to RPC/TDB Milestone Number: SPH336M4	2/19/99	4/30/99		
Alcove 1 Infil Expmt DP to RPC/TDB Milestone Number: SPH36M4	2/19/99	4/30/99		
Interp Rpt: Synthesis Frac Min Dating/CI-36 Milestone Number: SPH28M4	2/26/99	4/2/99		
Mid-Yr Update on Evaluation of Transient Data Milestone Number: SPH703M4	2/26/99	2/26/99	2/26/99	
Progress on Regional Recharge Estimates Milestone Number: SPH729M4	2/26/99	2/26/99	2/26/99	

USGS Level 4 Milestone Report

October 1, 1998 – February 28, 1999

Sorted by Baseline Date

<u>Deliverable</u>	Due Date	Expected Date	Completed Date	Comment
<i>FY99 milestone (from FY98/outyears schedule) delivered in October</i>				
Water-Level Altitude Data from the Periodic Network 10/1/97 through 6/30/98 Milestone SPH37KM4	10/30/98	10/30/98	10/9/98	Not in FY99 planning
<i>Late FY98 milestones delivered in October</i>				
Memo to TPO: Analy Cond for Input to Site Scale Mdl Milestone SPH253M4	9/30/98	9/30/98	10/2/98	
Memo to TPO: Analy Boundary Conds Oct-Jul 98 Milestone SPH225M4	9/30/98	9/30/98	10/2/98	
Memo to TPO: Chem/Iso Analy on Wtr Samples WT-17 Milestone SPC34CM4	9/15/97	9/30/98	10/8/98	

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
 Date Prepared 3/12/99 11:00 AM

Fiscal Month/Year February 28, 1999
Page 1 of 1

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
1.2.1	52	925	233	0	56	0	669	0	228
1.2.3	727	9594	2847	0	1241	0	10130	0	3496
1.2.4	7	148	0	0	11	0	158	0	15
1.2.5	41	253	742	0	286	0	639	0	203
1.2.8	34	469	0	0	0	0	665	0	164
1.2.9	42	696	136	0	71	0	600	0	226
1.2.12	4	160	0	0	0	0	100	0	37
1.2.15	153	1340	331	0	42	0	1450	0	660
	1060	13585	4289	0	1707	0	14411	0	5027

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
Date Prepared 3/12/99 11:02 AM

Fiscal Month/Year February 28, 1999
Page 1 of 1

SPAM	<u>CURRENT MONTH END</u>					<u>FISCAL YEAR</u>			
	ACTUAL COSTS	PARTICIPANT HOURS	SUBCONTRACT HOURS	PURCHASE COMMITMENTS	SUBCONTRACT COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
AMJX	39	320	742	0	286	0	639	0	211
AMMQ	7	148	0	0	11	0	123	0	15
AMNE	110	1347	350	0	0	0	720	0	568
AMNT	0	0	0	0	0	0	35	0	0
AMNW	514	6794	1821	0	1045	0	7449	0	2231
AMPP	183	2666	909	0	252	0	3195	0	1059
AMPW	195	2036	467	0	112	0	2050	0	886
AMRF	12	274	0	0	0	0	200	0	57
	1060	13585	4289	0	1706	0	14411	0	5027

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 1988 February 28, 1989

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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
0G1C81 Conduct Engineering Assurance Activiti	38.0	36.6	38.7	35.1	40.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	188.89
81912019U1 Engineering Assurance FY89	38.0	36.6	38.7	35.1	40.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	188.89
0G1C82 Personnel Qualifications - Deferred	3.0	3.9	4.3	3.5	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.70
0G1C82 Support Line Org. Doc. Issues/Backlog	2.8	3.0	1.7	2.9	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.36
81912019UX Support Line Organization, Docume	5.9	6.9	6.0	6.5	11.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.06
81912019	43.9	43.6	44.7	41.6	52.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.95
1.2.1	43.9	43.6	44.7	41.6	52.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.95
0G33124M8B Conduct Air-K & Hydrochemistry Testing	62.0	11.7	23.1	11.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	112.41
0G33124M8F Characterize Seepage into Alcoves I	14.1	18.6	18.7	8.8	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.06
0G33124M8G Characterize Seepage into Alcoves II	1.7	4.1	7.7	21.1	23.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.33
0G33127M82 Conduct Isotopic & Hydrochemical Anal	16.2	20.8	26.3	6.4	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.99
0G36221M81 Conduct Fluid Inclusion Studies	4.4	20.9	12.0	10.8	11.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.93
0G36221M83 Cond Frac Mineral Dtg & Iso Analy - ES	32.2	21.3	16.2	19.9	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	112.59
81912025U1 Moisture Monitoring & Fault Fractur	130.7	97.4	104.0	77.8	85.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	495.31
0G36221M85 Water Flux Thru Repository Block	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09
81912025UX Geochronology of Fracture Minerals	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09
81912025	130.7	97.4	104.0	77.8	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	495.40
0G33131M82 Cond. Hydraulic & Tracer Testing of Pro	39.9	34.4	57.9	-1.5	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	145.95
0G33132M81 Cond Isotopic & Hydrochemical Studies	8.6	29.9	26.8	3.4	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.13
0G36221M77 Paleodischarge at Nye County Sites	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0G33000M77 Provide SMF Well-Site Support	0.0	3.9	30.9	36.5	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.30
0G33000M81 Oversee Nye County Drilling Program	8.3	-5.2	4.8	1.9	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.71
81912029U1 8Z Data Analysis for SR FY89	56.8	62.9	120.5	40.3	70.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	351.09
81912029	56.8	62.9	120.5	40.3	70.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	351.09
0G33133M87 Reduce Uncertainty - Recharge Work	0.0	0.0	2.2	0.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.91
0G33133M87 Hydrogeologic Framework Model	8.1	2.5	-6.0	0.9	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.15
0G33133M87 Ground Water Flow Modeling	0.4	12.7	20.7	9.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.28
0G33133M87 Comp. Geo. Interpretations - Cross Sect	2.1	6.5	17.5	9.7	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.52
0G33133M87 Reduce Uncertainty - Hydrochemical Flo	0.0	0.0	3.5	6.0	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.90
0G33133M87 Comp. Geo. Interpretations - Hydrostruc	2.4	13.6	-0.7	6.2	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.75

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 1998 February 28, 1999

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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
0633133#87 Comp. Geo. Interpretations - Geologic	7.4	16.0	12.3	9.9	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.33
0633133#87 Comp. Geo. Interpretations - Amargosa	2.5	10.7	7.2	8.9	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.51
0633133#82 Conduct LA SZ Flow Model Sensivity A	0.0	3.0	5.6	2.1	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.22
0633133#83 Refine Geologic Framework Model	0.0	0.4	8.4	3.1	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.46
0633133#84 Develop Regional SZ Model	0.0	6.3	15.6	23.0	39.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.85
81912031U1 Regional and Site Scale Saturated Z	22.9	71.8	86.4	79.6	123.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	383.86
0633132#82 Iso & Hydrochem Studies SZ Water (WT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0633133#87 Refine Regional Hydrogeologic Framew	0.0	0.0	85.3	-85.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0633133#8A Reduce Uncertain Flux Values to Calibr	0.0	0.0	0.8	7.2	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.48
81912031UX SZ Modeling & Hydrochem Studies (0.0	0.0	86.1	-78.1	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.48
81912031	22.9	71.8	172.6	1.5	139.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	408.34
0632212#87 Conduct Geologic Mapping of the ECRB	0.0	16.3	78.0	77.4	71.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	243.38
81912050U2 Geologic Testing in the ECRB FY99	0.0	16.3	78.0	77.4	71.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	243.38
0633124#88 Eval Percolation Flux Across Repository	3.6	12.6	16.8	21.9	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.79
0633124#8D Conduct Moisture Monitoring in the ESF	17.1	27.8	20.5	21.6	13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.89
0636221#84 Cond E-W X-Drift Frac Min Dting & Iso	21.2	-14.1	4.9	2.7	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.17
81912050U3 Moisture Monitoring & Infiltration St	41.9	26.3	42.3	46.2	38.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	194.85
0632212#85 Conduct Geologic Mapping of the ECRB	75.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.00
81912050UX Geologic Mapping of the ECRB (Def	75.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	130.00
81912050	116.9	97.6	120.3	123.6	109.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	568.23
0632211#83 Complete Stratigraphic Descriptions UZ-	0.6	8.3	11.8	4.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.44
0632211#85 Correlate Lithostratigraphy & Geophysic	0.0	0.0	0.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.99
0632212#81 Provide Structural Support to Isotopic A	4.0	0.2	6.8	2.9	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.90
0632212#82 Conduct Fracture Syn in Sup of Reposit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0632212#83 Conduct Spatial Analysis of Fracture Int	0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0632212#84 Provide Geo Sup to LBNL Geophys Inve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0632212#85 Evaluate Short Trace Length Fract Distr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0632212#86 Char. Structure of Alcove - X-Drift Infil E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0632212#88 Conduct Fault Zone Studies	0.9	5.8	3.5	10.8	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.72
0632212#89 Provide Structural Support to TSPA/VA	29.8	18.9	9.8	13.5	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.06
06395#81 Provide USGS Support to 3-D Model: G	17.4	0.0	-9.3	-3.9	14.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.33

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 1998 February 28, 1999
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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
06395#82 Provide USGS Support to 3-D Model: St	0.0	0.0	0.0	11.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.79
81912210U1 Geologic Studies FY99	53.1	32.8	22.8	39.4	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	188.24
0632211#82 Conduct Stratigraphic Descriptions	8.9	14.0	-0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.12
81912210UX Stratigraphic Description of SD6WT	8.9	14.0	-0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.12
81912210	62.0	46.8	22.6	39.8	40.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	211.36
0633123#82 Hydraulic properties - Busted Butte Core	0.0	4.6	-0.7	0.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.87
0633124#8F Characterize Seepage into Alcoves I	0.0	13.7	13.0	0.5	-10.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.89
0633124#8G Characterize Seepage into Alcoves II	0.0	4.3	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.61
0633127#82 Cond Iso/Hydrochem Studies of UZ & P	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.37
0633127#84 Chlorine 36 Validation Studies	0.0	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.53
81912215U1 Moisture Monitoring & Fault Fractur	0.0	22.6	12.4	1.3	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.26
Paleodischarge/Paleoclimata - Deferred	0.0	0.0	15.2	8.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.69
81912215UX Paleodischarge/Paleoclimata (Deferr	0.0	0.0	15.2	8.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.69
81912215	0.0	22.6	27.6	9.7	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.95
0633132#81 Cond Isotopic & Hydrochemical Studies	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.69
0633000X#82 Oversee Nye County Drilling Program	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
81912245U1 SZ Data Analysis for BRULA FY99	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.69
0633127#83 Iso & Hydrochem Studies of UZ Water a	0.0	3.9	7.9	12.1	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.09
0633131#84 SZ Hydrologic Testing	9.0	7.2	2.8	4.9	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.04
81912245UX SZ Testing & UZ Hydrochemistry (D	9.0	11.2	10.6	17.0	17.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.14
81912245	9.0	11.2	10.6	17.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.83
06398#89 Support Preparation of the WDLA	26.3	23.1	54.1	24.5	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	167.99
81916105U1 Support for Preparation of the WDL	26.3	23.1	54.1	24.5	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	167.99
0632836#81 Rvw Impacts of New Data on Volcanic &	15.7	-11.4	22.6	5.6	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.73
0632000X#77 LADS Support - Expansion Area	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.27
0633129#81 Provide Updated UZ Model Abstractions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0633100X#81 Provide Support to Flow & Transport Mo	3.9	7.9	5.0	8.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.25
0633000X#77 LADS Support	0.0	5.1	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.77
81916105U2 Review of Literature and Special Stu	19.7	1.6	28.6	14.4	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.02
063286#82 Tectonic Closeout Activities	0.0	1.5	0.9	1.8	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.90

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0G33121H81 Coupled Infiltration Surface Water Flow	0.0	1.8	4.7	4.4	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.59
0G33123H81 Surface Based Testing Closeout Activiti	0.0	9.1	46.7	44.5	34.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	134.46
0G36221H86 Climate Closeout Activities	0.0	12.1	49.1	19.4	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.27
0G398HA1 Supports KTIs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
0G398HA1 Support Peer Reviews	4.9	-2.0	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.44
0G398HA1 Support Semiannual Progress Reports	0.0	5.0	2.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.73
0G398HA1 Support Topical Rpts: NVTRB, ACNW,	5.8	-5.1	0.5	1.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.32
0G398H1 Support Closeout Activities	0.0	0.0	0.0	4.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.82
81916105U3 Technical Interactions and Special P	10.7	22.3	103.7	77.5	88.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	302.52
81916105	56.7	47.0	186.4	116.4	133.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	539.54
0G33127H81 Conduct Chem. & Isotopic Analyses Drif	9.3	17.9	5.4	16.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.92
81916107U1 Isotope Support for Thermal Testing	9.3	17.9	5.4	16.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.92
81916107	9.3	17.9	5.4	16.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.92
0G33131H81 Conduct Water-Level Monitoring	7.3	8.3	9.3	19.9	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.63
81917027U1 Long-Term PG Monitoring FY99	7.3	8.3	9.3	19.9	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.63
81917027	7.3	8.3	9.3	19.9	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.63
Unfunded Work	91.7	97.0	-23.4	-11.6	-1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	152.04
	0.0	3.4	2.5	2.4	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.52
0G31H81 Support Scientific Programs Mgmt & Int	9.8	24.6	16.0	21.8	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.46
0G31H82 Manage Nevada Operations/Earth Scien	40.4	57.7	45.8	37.6	29.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.73
81919090U1 USGS SP&I FY99	141.9	182.7	40.9	50.2	49.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	464.75
0G398HA1C Provide Site Investigations Technical Su	27.1	38.5	34.1	55.6	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	195.37
0G398HA1D Provide Quality Checks for Documents	0.0	0.0	0.0	1.3	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.32
81919090U3 USGS Site Investigations Technical	27.1	38.5	34.1	56.9	48.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	204.69
0G398HA2C Support QA Compliance, Implementatio	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
81919090U4 QA Compliance, Implementation, an	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
81919090	169.0	221.2	75.0	107.2	97.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	669.44
1.2.3	640.4	704.9	854.2	569.1	720.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,488.74
0G40XH81 EBS Testing for LADS - Backfill (Before	0.0	0.0	5.9	2.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.82

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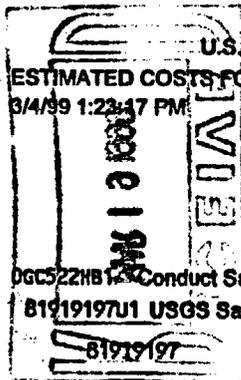
	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
81912382U1 EBS Testing for LADS	0.0	0.0	5.9	2.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.82
81912382	0.0	0.0	5.9	2.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.82
0G400N82 EBS Testing for LADS - Backfill (After 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
81912383U1 EBS Testing for LADS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
81912383	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
1.2.4	0.0	0.0	5.9	2.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.82
0G540X Provide Support to Performance Assess	0.9	6.1	5.4	11.8	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.27
81912220U1 USGS Support to Performance Asses	0.9	6.1	5.4	11.8	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.27
81912220	0.9	6.1	5.4	11.8	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.27
0G535N81 Provide Technical Data Coordination	38.8	31.1	43.1	25.4	35.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.99
81912470U1 Technical Data Management FY99	38.8	31.1	43.1	25.4	35.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.99
81912470	38.8	31.1	43.1	25.4	35.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.99
1.2.5	39.7	37.2	48.5	37.2	40.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	203.26
0G825N81 Implement Federal Safety & Occuretion	6.8	7.6	7.9	7.9	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.88
81919121U1 Federal Occupational Safety & Healt	6.8	7.6	7.9	7.9	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.88
0G847N81 Conduct Water Resources Studies	15.8	34.0	25.0	23.2	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125.47
81919121U2 Water Resources FY99	15.8	34.0	25.0	23.2	27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125.47
0G847N82 Water Appropriation Hearings	0.0	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.33
81919121U3 Water Appropriation Hearings	0.0	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.33
81919121	22.6	42.3	33.5	31.1	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	163.68
1.2.8	22.6	42.3	33.5	31.1	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	163.68
0G912N81 Provide TPO Office Support	14.3	26.9	25.2	27.2	23.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	117.26
81919135U1 USGS Project Management FY99	14.3	26.9	25.2	27.2	23.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	117.26
0G922N81 Conduct Project Control Activities	27.7	22.4	19.7	20.6	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	108.60
81919135U2 USGS Project Control FY99	27.7	22.4	19.7	20.6	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	108.60
81919135	42.0	49.3	44.9	47.8	41.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.87

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1.2.0	42.0	49.3	44.9	47.8	41.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.87
06F23M1 Conduct Satellite Records Operations	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
81919197U1 USGS Satellite Records Operations	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
81919197	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
1.2.12	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
06F23M1 Provide Support/Personnel Services	18.8	22.6	23.1	26.2	22.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	113.42
06F23M5 Provide Procurement & Property Manag	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.71
06F23M6 Provide Computer Support	13.6	25.2	16.1	18.3	39.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	113.08
81919110U1 Personnel, Procurement, Property S	32.4	47.8	39.2	44.5	68.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	232.21
06F23M2 Provide Facilities Management (space)	65.3	65.3	65.3	65.3	65.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	326.67
06F23M3 Provide Facilities Management (comput	13.7	13.7	13.7	13.7	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.33
06F23M4 Provide Facilities Management (other)	2.5	2.5	2.5	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.50
81919110U2 Facilities Management (USGS)	81.5	81.5	81.5	81.5	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	407.50
06F3M1 Provide USGS Training Support	6.1	1.7	4.1	4.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.38
81919111U1 USGS Training Support	6.1	1.7	4.1	4.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.38
81919110	120.0	131.0	124.8	130.8	153.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	660.08
1.2.15	120.0	131.0	124.8	130.8	153.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	660.08
1.2 OPERATING	919.0	1,017.0	1,166.8	863.7	1,052.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,019.39
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	919.0	1,017.0	1,166.8	863.7	1,052.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,019.39
FTEs													
FEDERAL	86.0	96.4	99.5	88.5	77.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	29.2	27.4	32.8	26.8	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	115.2	123.7	132.4	115.3	105.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	



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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
1.2.9	42.0	49.3	44.9	47.8	41.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	225.87
OGC522HB1 Conduct Satellite Records Operations	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
81919197U1 USGS Satellite Records Operations	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
81919197	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
1.2.12	10.3	8.8	10.2	4.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.99
OGF23HB1 Provide Support/Personnel Services	18.8	22.6	23.1	26.2	22.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	113.42
OGF23HB5 Provide Procurement & Property Manag	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.71
OGF23HB6 Provide Computer Support	13.6	25.2	16.1	18.3	39.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	113.08
81919110U1 Personnel, Procurement, Property S	32.4	47.8	39.2	44.5	68.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	232.21
OGF23HB2 Provide Facilities Management (space)	65.3	65.3	65.3	65.3	65.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	326.67
OGF23HB3 Provide Facilities Management (comput	13.7	13.7	13.7	13.7	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.33
OGF23HB4 Provide Facilities Management (other)	2.5	2.5	2.5	2.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.50
81919110U2 Facilities Management (USGS)	81.5	81.5	81.5	81.5	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	407.50
OGF3HB1 Provide USGS Training Support	6.1	1.7	4.1	4.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.38
81919111U1 USGS Training Support	6.1	1.7	4.1	4.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.38
81919110	120.0	131.0	124.8	130.8	153.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	660.08
1.2.15	120.0	131.0	124.8	130.8	153.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	660.08
1.2 OPERATING	919.0	1,017.0	1,166.8	863.7	1,052.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,019.39
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	919.0	1,017.0	1,166.8	863.7	1,052.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,019.39
FTEs													
FEDERAL	86.0	96.4	99.5	88.5	77.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	29.2	27.4	32.8	26.8	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	115.2	123.7	132.4	115.3	105.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

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