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

JUN 24 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 May 1998.

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

Stephan Brocoum
Assistant Manager for Licensing

AML:AVG-2036

Enclosure:
Ltr, 06/12/98, Craig to Kozai, w/encl.

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JUN 24 1998

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IN REPLY REFER TO:

INFORMATION ONLY

June 12, 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, May, 1998

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

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

Sincerely,

Raye Ritchey Arnold

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

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U.S. GEOLOGICAL SURVEY
EXECUTIVE SUMMARY

May, 1998

COORDINATION AND PLANNING

U.S. Geological Survey-Yucca Mountain Branch is currently processing 125 scientific papers prepared by USGS authors. Of these. 85 are related to geological studies, and 40 to hydrologic studies. In addition, 10 abstracts are being processed.

Reports published in May:

Savard, C.S., 1998. Estimated ground-water recharge from streamflow in Fortymile Wash near Yucca Mountain, Nevada: U.S. Geological Survey Water-Resources Investigations Report 97-4273, 30 p.

Day, W.C., Potter, C.J., Sweetkind, D.S., Dickerson, R.P., and San Juan, C.A., 1998, Bedrock geologic map of the central block area. Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-2601, 2 plates. pamphlet text, 15 p.

GEOLOGY

Geologic Framework

Ongoing support to LANL isotopic studies consisted of refining descriptions and classifications for existing ESF samples to be used in statistical analyses of the distribution of bomb-pulse chlorine-36 in the ESF and for hypothesis testing. USGS level 4 milestone SPG385M4 was submitted, confirming that a reviewed data package, consisting of all structural data and observations from the ECRB Cross Drift and boreholes SD-11 and SD-13 that are to be included in FY 98 LANL deliverables, had been completed and all appropriate data have been submitted to the Technical Data Base. Additional structural data and observations from the ECRB Cross Drift will not be conducted until FY 99, according to current work plans.

A poster report, entitled "Evaluation of Short-Trace-Length Fractures at Yucca Mountain, Nevada", was presented at the Spring meeting of the American Geophysical Union. The poster presented the results of activities related to an assessment of small-scale fracturing in the ESF.

Project staff conducted field work in the northen Crater Flat, upper Yucca Wash, upper Fortymile Wash, and Calico Hills areas as part of the 1:50,000-scale geologic map compilation for the Saturated-Zone Site Area. Also as part of the compilation of this map, data on the distribution of Quaternary units and other linework were digitized. Reviews and edits were performed on several reports, including the 1:24,000-scale geologic map of the Yucca Mountain area, the Sundance Fault map and report, and the Cross Drift cross sections, and work continued on the preparation of a report on the "Structural Geology of Yucca Mountain", which is intended for outside publication.

Compilation of worksheets for each of the boreholes in the database of geologic contacts continued. The compilation includes the identification of the QA-status, and details regarding which observations support geophysical interpretations. Preliminary lithostratigraphic determinations were made for boreholes WT-24 and SD-6, based on interpretations of available geophysical logs; results were discussed with M&O personnel. Methodologies used to compile and display borehole geophysical data were presented at the American Nuclear Society meeting held in Las Vegas in May. A spreadsheet template for use in tabulating T.V. observations of thermal alcove boreholes was refined, and a training session on the use of spreadsheets for compiling lithologic and structural information on shallow boreholes was conducted for project staff.

Seismotectonic Studies

A report on USGS activities related to the Global Positioning System was prepared and presented at the American Nuclear Society - High Level Nuclear Waste Conference held in Las Vegas on May 18. A poster on the Ghost Dance fault was also presented at the same meeting. QA and other training efforts related to studies bearing on the Global Positioning System were accelerated for staff in Menlo Park, CA, in order to facilitate new field work scheduled to begin during the month of May.

Preparation of an analysis of tectonic implications of basaltic volcanism in Crater Flat continued, as well as a discussion of mechanisms of coupled processes relevant to hazard estimation and scenario evaluation.

HYDROLOGY

Regional Hydrology

Routine maintenance continued of stream gages on Fortymile Wash and upper and lower Split and Pagany Washes on Yucca Mountain. Staff kept vigilance during the period for potential precipitation and runoff associated with several storms which passed through southern Nevada. No runoff was reported for the Yucca Mountain area. Computations of peak discharges for the February runoff for the four recording sites and at miscellaneous sites on and about Yucca Mountain were forwarded to the Nevada District Surface-Water Specialist for technical review. Work began on a draft USGS Fact Sheet documenting the February runoff. Streamflow and precipitation data collected through April 1998 have received initial checks and have been placed in Project files.

Unsaturated-Zone Hydrology

Staff from the borehole-monitoring group prepared final figures for the North Ramp report. Final revisions also were underway for the supplemental data package containing calibration-laboratory data on calibrations, shelter diagnostic runs (PREDs), and shelter reports. Borehole data from SD-12, NRG-7a, NRG-6, UZ #4, UZ #5, and UZ-7a were transferred to Denver, converted to engineering units, and archived on a routine basis throughout the month. Sensor readings were checked daily for unusual occurrences, and statistical outliers were flagged. Staff completed review of QMPs 3.03 and 5.05 and continued development work on a program to calculate static pressures. In calibration activities, six pressure-transducer runs were made, as were three thermistor-calibration runs and five Hastings mass-flow controller calibrations. Several pieces of Keithley equipment were sent to Bechtel for calibration. Most of the inventory of equipment has been completed. The UPS at site 7 (SD-12) damaged by a generator problem in April was repaired with an engineer's service call on May 27. Some 26 trips were made to field sites for correction of generator, UPS, chiller, and data-collection problems, dominated by visits for routine maintenance or generator problems.

Three-dimensional cross-hole pneumatic and tracer testing in the Northern Ghost Dance Fault Alcove was completed. Final tests included replicates of earlier tests to insure the QA of the test program. Results from the replicate tests matched the earlier test results, indicating full repeatability. Analysis of the Ghost Dance fault pneumatic and tracer testing, and report preparation, continued. The preliminary results of the northern Ghost Dance fault testing were compiled and presented at the High Level Radioactive Waste Management conference in Las Vegas (May 11 to 15) and at the American Geophysical Union conference in Boston (May 26 to 29). USGS staff continued using the Bureau of Reclamation fracture line-survey data to develop a discrete fracture model of the Ghost Dance fault. That discrete fracture model should provide a better understanding of fracture control of tracer transport in fractured tuff.

In characterization of seepage in the ESF, monitoring of temperature, relative humidity, and barometric pressure continued at selected alcoves and niches. Data are also being collected from 78 heat-dissipation (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 have been placed adjacent to the fault zone. A drip detection system was installed in Alcove #7. Atmospheric monitoring in Alcove #7 also continued. Air temperature, relative humidity and barometric pressure measurements are being made in the fault zone, adjacent to

the fault zone, and in the main drift for comparison. No moisture changes have been detected in the subsurface. Monitoring continued in Alcove #5. Data collected through the end of May were submitted informally to the PI for the Alcove #5 heater study. Support to E&I design-basis modeling is now complete. Any additional monitoring in Alcove #5 will be reported under the appropriate study making use of those data.

The seepage experiment in Alcove #1 started on March 9, and to date, approximately 48,800 gallons of water have been applied to the site. Water began dripping into the alcove between May 2 and May 5. As of May 31, 4404 liters of water had been collected from approximately 146 collection trays. Samples have been collected continuously to determine water volume and chemistry, and selected samples are being tested for pH, electrical conductivity (EC), and various aspects of water chemistry. A presentation of data and analysis was given at the NEPO management review in May. Ongoing atmospheric monitoring in Alcove #1 evaluated surface evaporation as water dripped into the collection chambers. Heat-dissipation data were collected to monitor moisture conditions in the rock. Only two of the sensors show a wet-up of the rock. Time-domain reflectometry (TDR) data are being used to determine changes in water content to complement the water-potential measurements. Once water flow in the alcove was initiated, it appeared that there is only a two-day delay from application to seepage. The original delay in water penetration likely was due to the initial wetting-up of the water-flow pathway. The electromagnetic equipment used to survey the infiltration pond indicated that the column of water moved directly downward with little lateral migration.

Efforts are ongoing to complete and confirm the data set collected from the 21 North Ramp boreholes. Those data include physical property, water-content, and water-potential information (collected from the preserved core samples and using *in situ* measurements with HD probes), saturated hydraulic conductivity, moisture retention, and unsaturated hydraulic conductivity curves. All physical property, water-content, and water-potential measurements were completed; HD measurements are still in the equilibration phase. Saturated hydraulic conductivity measurements are nearly complete, and repeat measurements are being made with the ultracentrifuge to confirm moisture-retention and unsaturated conductivity measurements. That data set should be finalized by July for initial development of the 2-D numerical model to assess the potential for lateral diversion in the PTn. Treatment of data from the vertical borehole which penetrated the PTn from Alcove #3 has been completed. Recovery unfortunately was very poor in sections of the hole, and several locations will require re-evaluation. That borehole and the two holes planned in Alcove #4 are intended to provide better resolution of initial boundary conditions for the 2-D model than can be obtained from the 21 2-m boreholes.

Using core samples from the North Ramp 2-m boreholes, methods are being evaluated to determine if the ultracentrifuge is the appropriate tool for determination of moisture retention, data then used to predict unsaturated hydraulic conductivity. This evaluation is being done for the suite of lithologies encountered from the Tiva Canyon Tuff columnar subzone (Tpcplnc) stratigraphically downward through all of the nonwelded PTn and into the welded Topopah Spring Tuff nonlithophysal zone (Tptrn). The analysis will be supported by an additional study to evaluate the effect of altered minerals on hydraulic properties by providing samples for evaluation from the Calico Hills and Prow Pass. The altered-mineral study incorporates samples from existing boreholes SD-6 and WT-24 through zones of mineral alteration, primarily in the transition zone at the vitric/zeolitic boundary but also including zones in the Prow Pass and the base of the Tiva Canyon. All samples will undergo measurements of physical properties, saturated hydraulic conductivity, estimation of bound water (residual water content), and measurements of altered-mineral content. Selected samples will be analyzed for moisture retention and unsaturated conductivity. Laboratory equipment is being arranged to measure imbibition on samples for which moisture retention and unsaturated conductivity have been determined, to evaluate the effects of the sorption phase of unsaturated flow on hydraulic parameters.

Several efforts involving moisture monitoring in the ECRB continued. Editorial comments by the USGS-YMPB Publications staff on the USGS open-file report entitled *Estimates of Physical Properties and Moisture Conditions along the East-West Cross Drift Alignment at Yucca Mountain, Nevada* were received. Those comments require substantial rewriting of the predictive report. Revisions to produce a report in a format consistent with other predictive reports are underway. Monitoring equipment (HD probes, data loggers, and temperature/relative humidity probes) continued to arrive at the site, and calibrations also continued. Monitoring stations to measure temperature, relative humidity, and wind speed were established near the mouth of the Cross Drift. Heat-dissipation

probes were installed in 2-m-deep drill holes at Cross Drift Stations 1+25 and 1+50, making five current locations with HD probes. Water potential was monitored in those holes as well as in holes at Stations 0+50, 0+75, and 1+00. All stations have been connected with a coaxial network to enhance data downloading. One 2-m borehole was drilled, cored and neutron-logged at Station 1+50. Neutron logging was also performed in holes at Stations 0+50 and 1+00. Logging will be done, when possible, to detect volumetric water loss from the tunnel walls. All available construction data (daily TBM advance, water use, changes in the vent system) are being collected in a spreadsheet to calculate evaporative water loss and to determine relative water loss from construction water versus formation water. In isotopic support to evaluation of infiltration of construction water in the ESF-ECRB, strontium analyses were completed for six samples from two boreholes. In addition, preparation of samples from SD-12 for strontium isotopic analyses for investigation of matrix water sources and fracture-matrix interaction began in May.

All samples for hydrologic characterization of surface-based borehole WT-24 have been processed for physical properties and moisture content. Samples have been requested from the SMF for subsampling to determine hydraulic conductivity and moisture retention. Less-than-saturated conditions in core samples from below the water-table level suggest the possibility of drying during packaging. (The SMF records the time from opening the core barrel to enclosing each sample in a can, and those times have been requested to evaluate any correlation. The field operating procedures request that the packaging process limit the core samples to a maximum exposure time to air of 5 minutes per core sample.) For SD-6, all samples have been received, and all but the deepest 10 samples have been processed for physical properties and moisture content. Those samples also appear to be drier than expected and will receive further evaluation. Samples have been requested from the SMF for subsampling to determine hydraulic conductivity and moisture retention.

Work to update the net-infiltration model with a surface-runoff module continued, as development of a stochastic air-temperature module proceeded, using NCDC regional meteorological records as well as records available for Yucca Mountain. Development of a new evapotranspiration (ET) module, which accounts for bare-soil evaporation and utilizes parameters defining vegetation type and density, also continued. Modifications made to allow for daily and annual mass-balance terms for each grid location were tested. Calibration of the coupled net-infiltration/surface-flow (runoff routing) model utilized available historic streamflow records for gages in Yucca Wash, Drill Hole Wash, Pagany Wash, Wren Wash, and Split Wash. Testing and calibration of a preliminary soil-depth model continued, using the 1980—95 daily precipitation record and 100-yr stochastic simulation of current climate. Incorporation of the updated geologic map into the geospatial parameter-input file continued. A sensitivity analysis of soil depth and effective bedrock permeability also continued. Based on input from paleoclimatic studies, evaluation of analog sites for developing stochastic simulations of daily precipitation for various potential future climates continued, using historic precipitation and air-temperature records available for analog sites. Input from paleoclimatic studies is also being used to estimate soil depth, soil type, and vegetation associations and densities for potential future climates. Application of the coupled net-infiltration/surface-flow (runoff routing) model to the Drill Hole Wash, Solitario Canyon, and Dune Wash watershed modeling domains using various wetter future climate analogs to analyze potential channel-flow volumes and to compare net infiltration along channel segments and lower sideslopes continued. A sensitivity analysis of the impact of air temperature on net infiltration and streamflow for potential future climates continued.

In UZ hydrochemical investigations, six ESF core samples were distilled and will be analyzed for tritium, D/H, and $^{18}O/^{16}O$. Core samples from borehole CWAT#3 were shipped to Denver. Seven ESF pore-water samples and one disguised spike were delivered for anion and cation analyses. Two WT-24 cores were distilled. Extracted pore water will be analyzed for tritium, D/H, and $^{18}O/^{16}O$. Additional pore water was collected using high-pressure one-dimensional compression of two samples. Five WT-24, three SD-6, and two UZ-7a pore-water samples were counted for tritium concentrations. Additional core samples from boreholes WT-24 and SD-6 were shipped to Denver. Major ions were analyzed in three SD-6 pore-water samples. Tritium concentrations, water collected by compression and distillation methods, and major-ion results from May were entered into appropriate data bases. In unscheduled work, the USGS UZ hydrochemistry lab participated in an interlaboratory analytical evaluation program (results to be published in the fall of 1998) and performed major-ion analyses. Staff attended the High Level Radioactive Waste Management conference in Las Vegas (May 11 to 14) and presented a paper (*Carbon and hydrogen isotopic compositions for pore water extracted from cores at Yucca Mountain, Nevada*, by Yang, Rattray, and Scofield) at the meeting.

Saturated-Zone Hydrology

Shakedown testing continued at UE-25 c#2 and c#3 (the C-hole complex) in preparation for hydraulic and tracer testing of the Prow Pass interval. Surface-based plumbing work and upgrading of the computerized data-acquisition system were performed. A 24-hr hydraulic test in the combined Prow Pass—Calico Hills interval was conducted by pumping c#2 and using c#1 and c#3 as observation wells.

Numerous water-level measurements were performed, including USW G-2 on May 12; UE-25 WT#6 on May 13; USW H-4 (lower interval), UE-25 WT#12, and USW WT-2 on May 19; USW H-1 (tubes 1, 2, 3, and 4) and UE-25 b#1 (upper interval) on May 20; UE-25 J-13, USW WT-1, and USW H-5 (upper and lower intervals) on May 21; USW H-3 (upper and lower intervals) and UE-25 WT#13 on May 26; UE-25 WT#13, UE-25 WT#15, UE-25 WT#16, and UE-25 p#1 on May 27; and USW WT-7, USW WT-10, USW WT-11, USW H-6 (upper and lower intervals), and USW VH-1 on May 28. Data were retrieved from USW G-2 and from UE-25 WT#6 through May 14.

Calibration efforts continued during the month. Work included a calibration check of Paro transducer (s/n 65021, Model 8WD020) from borehole USW G-2 on May 12. A calibration check of Paro transducer (s/n 65017, Model 8WD020) was performed with installation into borehole UE-25 WT#6.

Through May 27, borehole SD-6 had been drilled to a depth of about 2,541 ft below land surface (bls) and about 431 ft into the Bullfrog Tuff. The Bullfrog Tuff is the second unit of the lower volcanic aquifer. Depth to water in borehole SD-6 (tagged by drilling operations on May 8) is estimated to be 2,510 ft bls and is representative of the potentiometric surface of the lower volcanic aquifer. Perched water was not and is not expected to be encountered in SD-6. As a result, the planned possible hydraulic testing of a perched water body in SD-6 will not be conducted, and activity SPH229A [Conduct SD-6 borehole hydraulic tests of observed perched water] is complete as of May 27. While drillers were trying to clean a bridge out of the borehole, the bit became stuck at 2,541 feet. The LM-300 rig was removed from SD-6 during week of May 26, and another rig will be brought in to complete the SD-6 borehole. Level 4 **milestone SPH245M4 [Memo to TPO: Results of perched water hydraulic testing—SD-6]** was completed on May 27 with preparation of the necessary memorandum. A second Level 4 **milestone (SPH247M4 [Memo to TPO: Data to RPC/pumping and monitoring of perched water—SD-6])** also was completed on May 27.

Work on borehole WT-24 also continued. As of May 27, WT-24 had been drilled to a depth of 2,834 ft bls and about 313 ft into the Prow Pass Tuff. Since intersection of a fracture at 2,492 ft bls, no water-bearing fractures have been penetrated. It is estimated that WT-24 presently can be pumped at a rate of about 6 gallons per minute. A request has been made to deepen WT-24 until good hydraulic connection with the lower volcanic aquifer is established. Geophysical logging will be delayed until the borehole is completed. Technical review of the data package regarding pumping and testing of perched water in WT-24 has been completed. All review comments were resolved, and the data package was forwarded to the data-management section for processing and transmittal to the RPC.

In hydrochemical analysis of SZ ground water, upper SZ chemical samples were collected after the initial water entered borehole WT-24 at a depth of 2,492 ft below ground surface. The results of the analysis are not yet complete. Borehole SD-6 is not yet sufficiently cleaned to allow water sampling.

The report *Water levels in the Yucca Mountain area, Nevada, 1995* by R.P. Graves and Robert Goemaat (approved as Open-File Report 97-101) returned from the printers during May. Another report, *Water levels in the Yucca Mountain area, Nevada, 1996* by R.P. Graves (approved as Open-File Report 98-169 in April), remains in the Colorado District Reports Unit.

Various SZ modeling work continued. In testing of alternate conceptual SZ flow models, the relational database structure was reviewed and tested. Problems encountered during the review were repaired, and additional modifications to increase efficiency were made. Additions were also made to objects within the data base to assist user understanding of the data base and its organization. Documentation of customized code was started. The data

base was prepared and was submitted to the RPC to meet requirements of the related future milestone. Incorporation of the UGTA data base into the regional modeling data base also was started. Attempts to connect to the Oracle-based UGTA data base have so far been unsuccessful due to the complexity of the Oracle software and problems with current hardware/software configurations. In work on the regional hydrogeologic framework and flow models, interpretation holes in grids were repaired. Minor edits and inconsistencies with the UGTA framework model were corrected, with emphasis on pre-Cenozoic surfaces. Planning for integration of the regional ground-water flow model with the UGTA flow model also continued, as did planning for geologic mapping support of the Death Valley regional model. Staff calculated prediction-scaled sensitivities for advective travel for the Yucca Mountain flow path in the east-west, north-south, and vertical directions. Results indicate that advective travel is sensitive to K3, K4, and the K of the Eleana Formation, with the latter being extremely important to the simulation of vertical advective transport. Composite-scaled sensitivities indicate that the head and flow data provide substantial information about K3, somewhat less information about K4, and little information about the K of the Eleana. The latter case apparently occurs because the K of the Eleana Formation is so small that it could change substantially without affecting the simulated heads and spring flows which are compared to the measured values for the regression. The advective transport, however, appears to be very dependent on this value. More-accurate representation of the Eleana Formation is needed for refinement of the model. The YMP MODFLOWP model was run with the ADV package to simulate travel paths from beneath the potential repository. Movement of eight particles was simulated; one particle originated at the water table at the center of each of the eight finite-difference cells underlying the potential repository. Ground-water-model evaluation runs were performed to evaluate addition of vertical discretization to the regional ground-water flow model. Staff also completed runs of model-developing sensitivity distributions. Staff wrote and submitted a progress report for Level 4 milestone **SPH40PM4 [Memo to TPO: Progress report on regional model refinements]** which consisted of a memo to the USGS TPO documenting progress on refinements to the regional ground-water flow model including a discussion of changes in model boundaries, grid resolution, and vertical discretization. Work also continued on image processing of evapotranspiration (ET) areas and on field investigations to delineate various ET zones more completely. Staff submitted Level 4 milestone **SPH41GM4 [Memo to TPO: Progress on delineation of ET areas]**. Staff made changes to the WT-24 perched-water testing data package following the data review. The data package then was submitted to the RPC. Revisions were made to the text and figures for the USW G-2 aquifer-test report. Difficulties involved with converting file formats required several new formats to be tested and reviewed. Additional revisions were made to the climate-simulations report to accommodate referenced unpublished materials. Additional work remains before resubmittal for USGS Director's approval. Text and figures were compiled for use in a new report on perched water in the Yucca Mountain area. Work continued on a journal article describing the YMP MODFLOWP model. Staff also assisted in preparation of materials for the DOE water-appropriations hearings.

In other modeling work, staff reviewed chapter 3.7 of the TSPA-VA report and provided review comments to W. Arnold (SNL). Included were four technical comments, four general editorial comments provided in the review memo, and numerous editorial suggestions. Work continued on incorporation of the ISM3.0 model into the hydrogeologic framework model. The scientific notebook documenting work on the site SZ flow model was updated as the basis for summary of the modeling work. Specification of fluxes into the site model continued, based on flux distributions from the USGS regional model. That work has involved a model grid with a uniform horizontal spacing of 1,000 m. Various simulations have been made using permeabilities larger than those used in the previous version of the model, and scoping simulations were made using different zones to represent the Solitario Canyon Fault. Sensitivity analyses have been conducted to identify which parameters have the greatest influence on model results. Comment resolution continued from review of 1997 water-level data for the environmental monitoring program. Work was completed on data input for Excel spreadsheets for use in plotting hydrographs of water-level trends in the Yucca Mountain area. Acquisition of digital geologic maps to be used in updating regional and site-scale hydrogeologic framework models was initiated.

CLIMATE and PALEOHYDROLOGY

Staff completed a second major text edit of a draft report giving the basis for and estimates of the abundances and characteristics of hydrogenic minerals in the East-West Cross Drift. The revised report was re-submitted to the YMPB Publications Unit May 1 for processing as an Open-File Report entitled *Interpretations of paleohydrology*

from calcite and opal deposits in the Exploratory Studies Facility and estimates of the distribution and isotopic compositions of these minerals along the East-West Cross Drift alignment, Yucca Mountain, Nevada by J.B. Paces, B.D. Marshall, J.F. Whelan, L.A. Neymark and Z.E. Peterman. The report has received some additional editorial and QA review but has not yet been sent for USGS Director's approval.

Staff from the paleoclimate-study team accompanied Nye County representatives to Amargosa Valley to site future boreholes along Highway 95. Those planned holes constitute the first phase of Nye County's Early Warning Drilling Program and are intended to provide SZ ground-water samples downgradient of Yucca Mountain. Four of the holes will be drilled at ground-water past-discharge sites (NC-EWDP-1D, at the Lathrop Wells Diatomite [Horsetooth Site]; NC-EWDP-7S and –8S, at the Crater Flat Deposit [Site 199]; and NC-EWDP-9S at the Crater Flat Wash Deposit). Boreholes will be cored through the discharge deposits to obtain better information on the three-dimensional extent of the deposits and to obtain samples from older pluvial cycles for dating and for geochemical and paleontological study. Those data will provide better temporal constraints on discharge, allow comparison of isotopic and geochemical data from the deposits with data from present-day SZ water beneath the sites, and document the elevation of the modern potentiometric surface to constrain more precisely the amount of water-table fluctuation during past pluvial periods.

Sample preparation, and collection and analysis of diatom data, continued from Owens Lake core OL-92/2 from intervals between 162.7 and 190.33 m. in support of high-resolution paleoclimatic interpretations for the period 400 to 350 ka as an analog for potential future regional climate scenarios for Yucca Mountain. In similar efforts, ostracode samples are also in preparation. Staff continued responses to review comments on the climate and past-discharge open-file report. Revisions and comment resolution are underway after receipt of reviews of the climate chapter for the Site Description.

Work on fracture minerals resulted in preparation and presentation of several oral papers at the eighth High-Level Radioactive Waste Management conference in Las Vegas May 12 to 14. Full references for those papers are:

Marshall, B.D., Paces, J.B., Neymark, L.A., Whelan, J.F., and Peterman, Z.E., 1998, Secondary minerals record past percolation flux at Yucca Mountain, Nevada, *in* High Level Radioactive Waste Management, Proceedings of the Eighth International Conference, Las Vegas, Nevada, May 11—14, 1998: LaGrange Park, Illinois, American Nuclear Society, p. 127-129.

Neymark, L.A., Amelin, Yu V., Paces, J.B., and Peterman, Z.E., 1998, U-Pb age evidence for long-term stability of the unsaturated zone at Yucca Mountain, *in* High Level Radioactive Waste Management, Proceedings of the Eighth International Conference, Las Vegas, Nevada, May 11—14, 1998: LaGrange Park, Illinois, American Nuclear Society, p. 85-87.

Paces, J.B., Neymark, L.A., Marshall, B.D., Whelan, J.F., and Peterman, Z.E., 1998, Inferences for Yucca Mountain unsaturated-zone hydrology from secondary minerals, *in* High Level Radioactive Waste Management, Proceedings of the Eighth International Conference, Las Vegas, Nevada, May 11—14, 1998: LaGrange Park, Illinois, American Nuclear Society, p. 36-39.

Whelan, J.F., Moscati, R.J., Roedder, E. and Marshall, B.D., 1998, Secondary mineral evidence of past water table changes at Yucca Mountain, Nevada, *in* High Level Radioactive Waste Management, Proceedings of the Eighth International Conference, Las Vegas, Nevada, May 11—14, 1998: LaGrange Park, Illinois, American Nuclear Society, p. 178-181.

Whelan, J.F., and Moscati, R.F., 1998, 9 m.y. record of southern Nevada climate from Yucca Mountain secondary minerals, *in* High Level Radioactive Waste Management, Proceedings of the Eighth International Conference, Las Vegas, Nevada, May 11—14, 1998: LaGrange Park, Illinois, American Nuclear Society, p. 12-15.

SPECIAL STUDIES

Staff completed and submitted to the M&O a review of volume 1 of the VA document and provided concurrence to proposed resolution to comments on geology, hydrology and geochemistry as part of that VA document. Responses were also initiated for over 200 comments on the geology section of the PISA document. Several revisions to sections 2 and 3 were provided to the M&O. Various staff members attended the High-Level Radioactive Waste Management conference.

Because the drastically downsized SCPR #18 letter report was completed in April, there was minimal activity on the progress report during May. The M&O-USGS-YMSCO management review of SCPR #18 was completed. but no comments were referred to the USGS for resolution. In unscheduled work, the USGS technical lead for the SCPR served as a "reviewer of record" for two Viability Assessment volumes: Volume 1 (Site Description) and Volume 4 (License Application Plan and Costs). Using the computerized VA storyboard, about 80 comments were submitted regarding Volume 1, and about 35 comments were submitted for Volume 4.

WATER-RESOURCES MONITORING

Several efforts continued in support of radiological water-quality monitoring. Staff continued preparations for third-quarter FY1998 sample collection (in support of the M&O's Radiological/Environmental Field Programs). Discussions continued related to rescheduling of sample collection from May to June and to sample-preservation requirements with M&O Radiological/Environmental Program staff. Maps of current and proposed sampling locations and reports were provided to M&O Radiological/Environmental Program staff.

Ground-water levels were measured at 34 sites, and ground-water discharge was measured at one flowing well. Ground-water data collected during April were checked and filed. The summary monitoring report for calendar year 1996 (completed as FY1997 milestone SSH13GM3) was published during the week of May 4. Staff participated in the USGS-NV project review on May 11 and discussed hydrogeology of the region southeast of Yucca Mountain with NRC staff on May 20, providing reports on wells JF-3 and RV-1. In work on the summary monitoring report through calendar year 1997, staff responded to data-review comments related to periodic USGS water-level and spring-flow measurements. Processing and evaluation of pressure-sensor data collected at wells JF-3 and AD-6 were completed, and those data were forwarded for review. Staff began processing of periodic USGS water-level and spring-flow measurements made in the Ash Meadows area during 1997 and continuous NPS data collected at sites AM-4 and DV-1.

Participant YMP_USGS

Prepared - 06/12/98:15:36:12

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

01-May-98 to 31-May-98
Page - 1
Inc. Dollars in Thousands

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

		Current Period					FY1998 Cumulative to Date					FY1998 at Completion		
Id	Description	BCWS	BCWP	ACWP	SV	CV	BCWS	BCWP	ACWP	SV	CV	BAC	EAC	VAC
1.2.1	Systems Engineering	86	86	39	0	47	388	388	329	0	59	726	706	20
1.2.3	Site Investigations	1019	1007	881	-12	126	8223	8149	7540	-74	609	12488	13452	-964
1.2.5	Regulatory	56	56	58	0	-2	423	423	317	0	106	638	631	7
1.2.8	Environment, Safety, and H	49	49	47	0	2	402	402	376	0	26	600	660	-60
1.2.9	Project Management	58	58	59	0	-1	455	455	460	0	-5	683	685	-2
1.2.12	Information Management	6	6	5	0	1	51	51	31	0	20	77	65	12
1.2.15	Support Services	147	147	139	0	8	1161	1161	1052	0	109	1743	1658	85
Total		1421	1409	1228	-12	181	11103	11029	10105	-74	924	16955	17857	-902

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	16202	15656	223287
LABOR	924	986	983	993	669	703	727	766	782	742	675	654	9604
SUBS	150	160	165	180	219	228	235	244	283	281	268	268	2681
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	372	391	3915
Total BCWS	1330	1447	1468	1572	1240	1304	1321	1421	1668	1448	1375	1361	16955

Actual Cost of Work Performed

LBRHRS	19347	15629	18106	16797	14905	16396	16949	18484	0	0	0	0	136613
LABOR	698	634	670	735	608	727	635	725	0	0	0	0	5432
SUBS	190	151	226	140	242	228	268	191	0	0	0	0	1636
TRAVEL	6	27	75	31	49	38	63	59	0	0	0	0	348
PM&E	0	62	22	131	215	127	495	113	0	0	0	0	1165
OTHER	16	275	148	204	328	160	253	140	0	0	0	0	1524
Total ACWP	910	1149	1141	1241	1442	1280	1714	1228	0	0	0	0	10105

Participant YMP_USGS
Prepared - 06/12/98:15:36:12

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

01-May-98 to 31-May-98
Page - 2
Inc. Dollars in Thousands

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	24226	23780	22285	20526	90817
LABOR	0	0	0	0	0	0	0	0	1087	1074	986	955	4102
SUBS	0	0	0	0	0	0	0	0	314	341	335	319	1309
TRAVEL	0	0	0	0	0	0	0	0	96	105	95	81	377
PM&E	0	0	0	0	0	0	0	0	0	4	7	0	11
OTHER	0	0	0	0	0	0	0	0	518	447	524	464	1953
Total ETC	0	0	0	0	0	0	0	0	2015	1971	1947	1819	7752

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	1375	1361	16955
BCWP	1270	1404	1415	1520	1205	1357	1449	1409	0	0	0	0	11029
ACWP	910	1149	1141	1241	1442	1280	1714	1228	0	0	0	0	10105
ETC	0	0	0	0	0	0	0	0	2015	1971	1947	1819	7752

Fiscal Year Distribution

	Prior	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	Future	At Complete
BCWS	32296	16955	9517	4027	920	279	0	0	0	0	0	0	63994
BCWP	32009	11029	0	0	0	0	0	0	0	0	0	0	
ACWP	32040	10105	0	0	0	0	0	0	0	0	0	0	
ETC	0	7752	9517	4026	920	279	0	0	0	0	0	0	64639

USGS Level 3 Milestone Report

October 1, 1997 - May 31, 1998

Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
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	

USGS Level 4 Milestone Report

October 1, 1997 - May 31,
Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
Memo to TPO: Draft PISA Hydrology Chaptr Section **Milestone Number:** SPH392M4	8/29/97	6/30/98		
Memo to TPO: Hydro-Property Measurements **Milestone Number:** SPH235M4	9/4/97	8/14/98		
Memo to TPO: Docmnt Data Package Submittal **Milestone Number:** SPH236M4	9/10/97	8/14/98		
Memo to TPO: Chem/Iso Anlys on Wtr Samples WT-17 **Milestone Number:** SPC34CM4	9/24/97	7/17/98		
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 Incorp in GENISES **Milestone Number:** SPH395M4	11/25/97	7/31/98		
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	6/30/98		

Deliverable	Due Date	Expected Date	Completed Date	Comments
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	9/21/98		
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	8/3/98		
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 Chpter **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	6/30/98		
Memo to TPO: Frac Connectivity Data to SNL/LBL **Milestone Number:** SPG230M4	2/27/98	2/20/98	2/20/98	

Deliverable	Due Date	Expected Date	Completed Date	Comments
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	9/21/98		
Memo to TPO:Data to RPC Pmp/Monit Prch Wtr WT-24 **Milestone Number:** SPH242M4	3/13/98	6/16/98		
Memo to TPO: Analys Cond/Properties Cross Drift **Milestone Number:** SP33ACM4	3/27/98	6/19/98		
Memo to TPO: ECRB Spatiotemporal Predictions **Milestone Number:** SPC237M4	3/27/98	6/19/98		
Memo to TPO: Lithostratigraphy Log for WT-24 **Milestone Number:** SPG223M4	3/27/98	10/6/98		
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	

Deliverable	Due Date	Expected Date	Completed Date	Comments
lemo to TPO: Inventory of Hydro Data Completed **Milestone Number:** SPH40MM4	3/31/98	3/24/98	3/24/98	
lemo to TPO: Updated Reg Frmwrk Mdl to Rev **Milestone Number:** SPH40QM4	3/31/98	6/30/98		
lemo to TPO: Progress on Delineation of ET Area **Milestone Number:** SPH41GM4	3/31/98	5/29/98	5/29/98	
lemo to TPO: Doc Hydraul rop. Test SD-6 **Milestone Number:** SPH246M4	4/6/98	11/4/98		
Publish Sel Streamflow & Precip Data for FY97 **Milestone Number:** SPH36CM4	4/6/98	6/19/98		
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	1/26/99		
Memo to TPO: Data to RPC Pmp/Moni 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	9/8/98		
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	

Deliverable	Due Date	Expected Date	Completed Date	Comments
Memo to TPO: Prov Analy of Pred vs Actual, WT-24 **Milestone Number:** SPG33UM4	5/15/98	7/1/98		
Memo to TPO: Hydraulic Prop. Test WT-24 **Milestone Number:** SPH244M4	5/20/98	4/22/99		
Memo to TPO: Updated Reg Flow Model to Rev **Milestone Number:** SPH40PM4	5/29/98	5/29/98	5/29/98	
Memo to TPO: Memo to TPO: Geologic Map of Sundance Fault **Milestone Number:** SPG238UM4	6/1/98	6/1/98	5/29/98	
Memo to TPO: Memo to TPO: Oct97-Mar98 Data to RPC/TDB **Milestone Number:** SPH36IM4	7/1/98	7/1/98	5/26/98	
Memo to TPO: Memo to TPO: Oct97-Mar98 Data to RPC/TDB **Milestone Number:** SPH36TM4	7/1/98	7/1/98	5/26/98	

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
Date Prepared: 6/12/98 12:36 PM

Fiscal Month/Year May 31, 1998

	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	39	764	135	0	41	0	702	0	326
1.2.3	879	13693	2995	0	841	0	12697	0	7569
1.2.5	58	472	744	0	183	0	652	0	321
1.2.8	47	690	0	0	0	0	595	0	382
1.2.9	60	861	241	0	76	0	652	0	461
1.2.12	5	176	0	0	0	0	73	0	30
1.2.15	139	1506	307	0	53	0	1665	0	1053
	1227	18162	4422	0	1194	0	17036	0	10142

U.S. GEOLOGICAL SURVEY

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

6/5/98 3:29:45 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	0.0	0.0	0.0	0.0	325.0
121C9075U1	USGS Engineering Assurance (EA)	35.7	25.2	72.7	32.8	40.0	69.6	11.3	37.7	0.0	0.0	0.0	0.0	325.0
0G1CGA2	Documentation/Backlog Issues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	1.2
0G1CGA3	Personnel Qualification	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
121C9075U2	Support to Line Org. for Documentatio	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	1.2
121C9075		35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	0.0	0.0	0.0	0.0	326.3
	1.2.1.1	35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	0.0	0.0	0.0	0.0	326.3
	1.2.1	35.7	25.2	72.7	32.8	40.0	69.6	11.3	38.9	0.0	0.0	0.0	0.0	326.3
0G311GA1	Scientific Programs Management & Integ	19.7	14.8	24.4	14.1	19.8	20.2	18.9	19.2	0.0	0.0	0.0	0.0	151.1
0G312GA1	Manage Nevada Operations/Earth Scien	73.3	53.2	53.6	52.7	111.1	30.2	44.4	37.9	0.0	0.0	0.0	0.0	456.5
12319090U1	USGS SP&I	93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	0.0	0.0	0.0	0.0	607.6
12319090		93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	0.0	0.0	0.0	0.0	607.6
	1.2.3.1	93.0	68.0	78.0	66.8	130.9	50.5	63.3	57.2	0.0	0.0	0.0	0.0	607.6
0G32836FB1	Conduct Probabilistic Seismic Hazards A	11.5	-3.7	19.5	1.5	4.3	-2.4	11.2	-5.3	0.0	0.0	0.0	0.0	36.7
0G32836GB3	Support Seismic Design Input	18.9	22.6	6.6	27.2	17.4	18.3	2.1	23.8	0.0	0.0	0.0	0.0	137.0
12321155U1	Prepare Seismic Design Inputs	30.5	18.9	26.2	28.7	21.8	15.9	13.3	18.4	0.0	0.0	0.0	0.0	173.6
0G32836FB1	Conduct Probabilistic Seismic Hazards A	0.0	6.1	1.0	10.5	11.6	6.1	11.9	3.6	0.0	0.0	0.0	0.0	50.9
12321155UC	Conduct Prob. Seismic Hazards Ass.	0.0	6.1	1.0	10.5	11.6	6.1	11.9	3.6	0.0	0.0	0.0	0.0	50.9
0G32836FB1	Probabilistic Seismic Hazards Analysis -	0.0	0.0	0.0	11.2	1.2	26.8	12.3	11.0	0.0	0.0	0.0	0.0	62.5
12321155UY	PSHA - Deferred	0.0	0.0	0.0	11.2	1.2	26.8	12.3	11.0	0.0	0.0	0.0	0.0	62.5
12321155		30.5	25.0	27.2	50.4	34.6	48.8	37.5	33.1	0.0	0.0	0.0	0.0	287.0
0G32211GA1	Stratigraphic Support to LA & Confirmati	21.4	9.6	12.5	20.8	19.2	9.1	5.6	8.7	0.0	0.0	0.0	0.0	106.8
12322210U1	Stratigraphy	21.4	9.6	12.5	20.8	19.2	9.1	5.6	8.7	0.0	0.0	0.0	0.0	106.8
0G32212GA3	Structural Support to LA & Confirmation	0.8	0.2	4.3	-1.8	3.5	0.0	6.0	11.8	0.0	0.0	0.0	0.0	24.7
0G32212GB1	Conduct Fracture Studies	3.9	3.7	7.8	1.4	2.2	5.6	9.2	2.7	0.0	0.0	0.0	0.0	36.5
0G32212GB2	Publish Maps & Reports for Structural St	12.0	5.1	-8.5	12.2	0.8	-5.7	10.0	19.2	0.0	0.0	0.0	0.0	45.0
0G32212GB4	Structural Support to TSPA/VA	2.1	3.1	9.3	4.0	3.2	28.6	26.8	16.3	0.0	0.0	0.0	0.0	93.4
12322210U2	Structure	18.7	12.1	12.9	15.8	9.6	28.4	52.0	50.0	0.0	0.0	0.0	0.0	199.6
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	0.0	0.0	0.0	0.0	42.5
12322210U4	Eval. BH Video Logs - DSHT BHs	1.3	8.6	-5.1	0.4	0.2	16.7	14.6	5.7	0.0	0.0	0.0	0.0	42.5
0G32211FB2	Stratigraphic Descriptions - WT-24/SD-6	0.0	18.5	2.6	1.4	0.5	0.7	0.4	2.4	0.0	0.0	0.0	0.0	26.6

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12322210UC	Stratigraphic Descriptions - SD6/WT2	0.0	18.5	2.6	1.4	0.5	0.7	0.4	2.4	0.0	0.0	0.0	0.0	26.6
0G32211FB2	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	0.0	0.0	0.0	0.0	379.3
0G32212FB2	Complete Site Area Geologic Map - ECR	0.0	29.6	35.7	29.7	37.9	10.4	-6.7	9.1	0.0	0.0	0.0	0.0	145.7
0G32212FB5	Geologic Mapping of the ECRB	55.2	69.6	46.7	71.4	59.0	63.2	120.0	106.5	0.0	0.0	0.0	0.0	591.7
0G32733FB1	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	0.0	0.0	0.0	0.0	784.3
12326050		55.9	106.7	94.1	111.4	108.4	75.4	116.9	115.6	0.0	0.0	0.0	0.0	784.3
0G32212GB3	Structural Support to Isotopic Age Studie	3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	0.0	0.0	0.0	0.0	14.3
12327025U1	Structural Support to Isotopic Age Stud	3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	0.0	0.0	0.0	0.0	14.3
12327025		3.9	0.9	0.2	1.7	0.7	5.2	0.0	1.7	0.0	0.0	0.0	0.0	14.3
	1.2.3.2	131.6	181.4	148.0	202.0	173.2	184.4	227.0	217.3	0.0	0.0	0.0	0.0	1464.9
0G33133GBF	Support VA SZ Flow Model Sensitivity A	2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	0.0	0.0	0.0	0.0	24.4
12331200U1	Abs/Testing SZ Flow Model for VA	2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	0.0	0.0	0.0	0.0	24.4
12331200		2.3	2.2	3.7	2.7	1.0	3.3	0.7	8.7	0.0	0.0	0.0	0.0	24.4
0G33124GB5	PTn Lateral Diversion (Phase II)	6.9	7.4	3.3	9.3	4.1	0.2	6.7	12.7	0.0	0.0	0.0	0.0	50.6
12332245U1	Hydrostratigraphy	6.9	7.4	3.3	9.3	4.1	0.2	6.7	12.7	0.0	0.0	0.0	0.0	50.6
0G33123GB4	Est. of Effective Porosity Values for Topa	0.0	0.0	4.1	0.2	-3.5	6.5	13.7	13.6	0.0	0.0	0.0	0.0	34.7
12332245U2	Surface-Based Borehole Testing	0.0	0.0	4.1	0.2	-3.5	6.5	13.7	13.6	0.0	0.0	0.0	0.0	34.7
0G33124FBB	Air-K & Hydrochemistry Testing ESF	45.0	36.6	71.8	43.8	52.1	51.2	58.7	43.8	0.0	0.0	0.0	0.0	402.9
12332245U3	ESF Borehole Testing	45.0	36.6	71.8	43.8	52.1	51.2	58.7	43.8	0.0	0.0	0.0	0.0	402.9
0G33123GB3	Unsaturated Matrix Flow Properties	6.3	17.8	0.9	11.9	12.1	21.9	12.7	1.3	0.0	0.0	0.0	0.0	84.8
0G33123GB5	Backfill Hydrologic Properties Measurem	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
12332245U4	Hydrologic Properties Measurements	6.3	17.8	0.9	11.9	12.1	21.9	12.7	1.3	0.0	0.0	0.0	0.0	84.8
0G33124GB7	ESF Drift-Scale Flux & Niche Study (Pha	0.0	5.5	23.5	-3.5	9.8	13.1	7.4	13.9	0.0	0.0	0.0	0.0	69.6
0G33124GBF	Characterization of Seepage in Alcoves	11.3	36.4	38.6	34.8	35.6	9.5	93.9	23.4	0.0	0.0	0.0	0.0	283.4
12332245U5	Percolation and Seepage	11.3	41.8	62.0	31.3	45.4	22.6	101.3	37.2	0.0	0.0	0.0	0.0	352.9
0G33131GB2	Hydraulic/Tracer Test of Prow Pass Tuff	20.2	7.1	10.0	5.4	11.6	39.7	39.9	32.3	0.0	0.0	0.0	0.0	166.0
0G33131GB4	SZ Hydraulic Testing of Borehole USW	0.0	2.4	0.3	1.8	37.1	11.6	49.2	18.9	0.0	0.0	0.0	0.0	121.2
0G33131GB5	SZ Hydraulic Testing of Borehole USW	0.0	0.0	0.6	0.0	0.0	2.8	9.6	1.1	0.0	0.0	0.0	0.0	14.0

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0G33133GA3	Planning for STC SZ Confirmation Studi	1.5	-1.2	6.4	3.4	7.5	8.6	6.3	3.6	0.0	0.0	0.0	0.0	36.2
12332245U6	Saturated Zone Testing	21.7	8.3	17.2	10.6	56.2	62.7	104.9	55.8	0.0	0.0	0.0	0.0	337.4
0G33127GB1	Matrix Water Sources and Fract.-Matrix I	10.7	8.7	6.1	12.2	3.6	8.1	8.2	4.0	0.0	0.0	0.0	0.0	61.6
0G33127GB2	Iso./Hydrochem. Studies of UZ Water an	13.5	17.3	16.8	19.8	44.5	6.7	81.7	11.0	0.0	0.0	0.0	0.0	211.1
12332245U7	UZ Hydrochemistry	24.2	25.9	22.9	32.0	48.1	14.8	89.9	15.0	0.0	0.0	0.0	0.0	272.7
0G33123FBF	Hydrologic Charac. of SB BH - WT-24/S	0.0	0.0	11.2	3.8	4.6	13.1	-3.2	-2.6	0.0	0.0	0.0	0.0	27.0
12332245UC	Matrix Properties - SD6/WT24	0.0	0.0	11.2	3.8	4.6	13.1	-3.2	-2.6	0.0	0.0	0.0	0.0	27.0
0G33131FBG	Perched Wtr & SZ Hydrologic Tstg - WT	27.2	11.5	28.2	17.2	21.2	39.4	39.5	34.8	0.0	0.0	0.0	0.0	219.0
0G33131FBH	Iso/Hydrochem Smplg/Anal of SZs - WT	8.2	7.3	5.6	8.0	13.4	1.9	-0.3	-38.8	0.0	0.0	0.0	0.0	5.2
12332245UD	Hydrologic Tst/Hydrochem. Samping	35.4	18.8	33.8	25.1	34.6	41.3	39.2	-4.0	0.0	0.0	0.0	0.0	224.3
0G33124FBF	South Ramp Hydrology (RM)	1.5	6.1	3.6	19.2	13.2	32.1	6.6	4.0	0.0	0.0	0.0	0.0	86.2
0G33124FBG	PTn Lateral Diversion - Ph I (RM)	0.0	0.8	0.0	0.9	17.1	12.2	22.3	7.2	0.0	0.0	0.0	0.0	60.5
12332245UR	Risk Mitigation - Hydrostratigraphy	1.5	6.9	3.6	20.0	30.3	44.3	28.9	11.1	0.0	0.0	0.0	0.0	146.7
0G33124FBH	ESF Drift Scale & Niche Study (RM)	7.3	2.6	-2.9	20.0	28.2	22.7	0.9	5.4	0.0	0.0	0.0	0.0	84.2
0G33124GA1	Support E&I Design Basis Modeling (RM	0.7	-0.7	0.0	0.0	0.0	3.8	6.1	3.8	0.0	0.0	0.0	0.0	13.7
12332245US	Risk Mitigation - Percolation & Seepag	8.0	1.9	-2.9	20.0	28.2	26.5	6.9	9.3	0.0	0.0	0.0	0.0	97.9
0G33123FBF	Char. Hydr. of SB Boreholes - Deferred	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
12332245UW	Matrix Properties WT-24 Deferred	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
0G33131FBG	Conduct Perched Water & SZ Hydraulic	1.5	40.1	-16.7	4.5	60.7	0.0	1.1	0.0	0.0	0.0	0.0	0.0	91.3
0G33131FBH	Iso/Hydrochem Smplg/Init Analyses of S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.6	0.0	0.0	0.0	0.0	56.6
12332245UX	Hydrologic Testing/Hydrochem Sampli	1.5	40.1	-16.7	4.5	60.7	0.0	1.1	56.6	0.0	0.0	0.0	0.0	147.9
0G33131FBB	Conduct Chemical & Isotopic Analysis -	0.0	0.0	0.0	0.0	0.0	0.0	3.6	6.3	0.0	0.0	0.0	0.0	9
0G33131FBF	Conduct C-Holes Testing - Deferred	3.4	6.8	29.3	34.0	21.5	10.9	3.9	9.9	0.0	0.0	0.0	0.0	119.7
12332245UY	SZ Testing - Deferred	3.4	6.8	29.3	34.0	21.5	10.9	7.5	16.2	0.0	0.0	0.0	0.0	129.6
0G33121GB2	Update & Enhance Net Infiltration Numer	7.1	17.7	5.7	14.2	17.1	12.2	2.5	5.8	0.0	0.0	0.0	0.0	82.2
0G33121GB3	Prediction of Future Net Infil. Rates in Re	0.0	0.0	0.0	5.2	0.5	11.0	29.8	1.7	0.0	0.0	0.0	0.0	48.3
12332247U1	UZ Modeling	7.1	17.7	5.7	19.4	17.5	23.2	32.3	7.5	0.0	0.0	0.0	0.0	130.5
0G33131GB8	Reduce Uncert. in Flux Values Used to C	2.2	7.9	3.7	5.0	5.4	3.0	3.4	9.8	0.0	0.0	0.0	0.0	40.4
0G33133FB6	Confirm SZ Hydrologic Flow Models	14.3	20.6	21.4	20.6	22.3	-0.2	8.0	7.7	0.0	0.0	0.0	0.0	114.6
0G33133GB4	Refine Calibration of Site SZ Flow Model	8.6	7.2	9.2	10.6	13.7	22.3	10.3	11.8	0.0	0.0	0.0	0.0	93.6
0G33133GB6	Test Alternate Conceptual Models	6.1	2.9	6.6	10.7	3.1	11.0	3.7	9.2	0.0	0.0	0.0	0.0	53.3

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0G33133GB7	Refine Regional Hydrogeologic Framewo	20.4	8.8	24.8	17.6	22.3	15.2	16.3	6.1	0.0	0.0	0.0	0.0	131.5
12332247U2	SZ Modeling	51.6	47.3	65.8	64.5	66.7	51.3	41.7	44.6	0.0	0.0	0.0	0.0	433.6
0G33132GB1	Iso/Hydrochem. Analysis of SZ Ground	24.9	28.2	-0.3	21.3	87.2	24.8	110.7	29.8	0.0	0.0	0.0	0.0	326.7
12332247U4	Isotopic/Hydrochemical SZ Studies	24.9	28.2	-0.3	21.3	87.2	24.8	110.7	29.8	0.0	0.0	0.0	0.0	326.7
12332245		248.7	305.7	311.8	351.8	565.8	415.3	653.2	347.9	0.0	0.0	0.0	0.0	3200.1
0G33124FB8	Percolation Flux Across Repository Horiz	0.0	26.4	24.4	68.0	36.2	-10.0	5.8	16.5	0.0	0.0	0.0	0.0	167.3
0G33124FBD	Moisture Monitoring in the ESF - ECRB	5.9	8.0	7.0	-6.3	0.9	5.2	39.5	49.3	0.0	0.0	0.0	0.0	109.4
0G33124GBA	Infiltration of Construction Water in ESF	10.7	-3.0	0.2	15.1	6.8	1.7	13.2	4.8	0.0	0.0	0.0	0.0	49.5
12336050U3	Infiltration, Percolation & Seepage	16.6	31.3	31.6	76.7	43.9	-3.1	58.5	70.6	0.0	0.0	0.0	0.0	326.2
12336050		16.6	31.3	31.6	76.7	43.9	-3.1	58.5	70.6	0.0	0.0	0.0	0.0	326.2
0G33112FB1	Collection of Site Streamflow Data	11.7	-0.7	6.2	24.8	7.4	21.2	-13.4	31.5	0.0	0.0	0.0	0.0	88.7
0G33112GB1	Collection of Site Streamflow Data	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12337025U2	Surface Water Monitoring	11.7	-0.7	6.2	24.8	7.4	21.2	-13.4	31.5	0.0	0.0	0.0	0.0	88.7
0G33123FBB	UZ Borehole Instrumentation & Monitorin	18.4	16.1	25.8	30.7	-11.7	10.3	-6.0	-0.9	0.0	0.0	0.0	0.0	82.7
0G33123FBC	Integrated Analysis & Interpretation	13.6	7.7	14.4	19.5	-13.1	13.2	0.2	-0.2	0.0	0.0	0.0	0.0	55.2
0G33123GB1	UZ Borehole Instrumentation & Monitorin	6.9	6.1	7.6	6.3	29.5	19.0	29.2	36.6	0.0	0.0	0.0	0.0	143.2
0G33123GB2	Integrated Analysis & Interpretation	0.0	0.0	0.0	5.0	3.8	-1.3	0.0	0.0	0.0	0.0	0.0	0.0	7.5
12337025U3	Surface Based Hydrologic Monitoring	38.9	29.9	47.8	61.5	8.5	41.1	23.4	37.6	0.0	0.0	0.0	0.0	288.6
0G33131FBD	Water-Level Monitoring	10.3	0.1	-1.9	0.5	4.2	9.0	8.1	0.8	0.0	0.0	0.0	0.0	31.2
0G33131GB1	Water-Level Monitoring	5.5	11.2	8.8	7.5	6.9	4.8	12.4	5.6	0.0	0.0	0.0	0.0	62.8
12337025U5	Saturated-Zone Monitoring	15.8	11.4	6.9	8.0	11.1	13.8	20.5	6.5	0.0	0.0	0.0	0.0	94.0
0G33127GB3	Isotope Support for Thermal Testing	0.0	8.0	4.4	4.9	5.3	2.2	2.2	-2.6	0.0	0.0	0.0	0.0	24.5
12337025U6	Isotope Support for Thermal Testing	0.0	8.0	4.4	4.9	5.3	2.2	2.2	-2.6	0.0	0.0	0.0	0.0	24.5
12337025		66.4	48.5	65.3	99.2	32.3	78.4	32.7	72.9	0.0	0.0	0.0	0.0	495.8
	1.2.3.3	334.0	387.6	412.4	530.4	642.9	493.8	745.2	500.1	0.0	0.0	0.0	0.0	4046.5
0G36215GB2	Future 100K Climate Records	0.0	4.7	4.1	9.6	7.1	4.2	30.2	13.7	0.0	0.0	0.0	0.0	73.6
12362252U1	Paleoclimate Analysis	0.0	4.7	4.1	9.6	7.1	4.2	30.2	13.7	0.0	0.0	0.0	0.0	73.6
0G36221GB3	Water Flux Det. Thru Repos. Blk - Age,	17.4	3.8	23.8	15.2	22.5	-3.1	11.8	2.8	0.0	0.0	0.0	0.0	94.2
12362252U2	Geochronology of Fracture Minerals - L	17.4	3.8	23.8	15.2	22.5	-3.1	11.8	2.8	0.0	0.0	0.0	0.0	94.2
0G36221GB1	Paleoclimate Confirmatory Analyses - LA	11.8	9.2	-4.9	9.3	16.9	10.8	91.0	10.6	0.0	0.0	0.0	0.0	154.8
12362252U3	Paleohydrology and WT Fluctuations	11.8	9.2	-4.9	9.3	16.9	10.8	91.0	10.6	0.0	0.0	0.0	0.0	154.8

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12362252		29.2	17.6	23.0	34.1	46.4	12.0	133.0	27.1	0.0	0.0	0.0	0.0	322.5
0G36221FB3	Syn. Distr./Anal. Geochron. Age Dets. (E	6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	0.0	0.0	0.0	0.0	248.5
12366050U1	Fracture Mineral Age Dating	6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	0.0	0.0	0.0	0.0	248.5
12366050		6.2	12.5	41.6	14.9	8.1	17.6	127.1	20.5	0.0	0.0	0.0	0.0	248.5
0G36221GB4	Data Qualification for NRC	0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	0.0	0.0	0.0	0.0	8.8
12367027U2	Data Qualification Evaluation for the N	0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	0.0	0.0	0.0	0.0	8.8
12367027		0.0	0.0	0.0	2.9	3.7	-3.7	0.6	5.4	0.0	0.0	0.0	0.0	8.8
	1.2.3.6	35.5	30.1	64.6	51.8	58.3	25.8	260.7	53.0	0.0	0.0	0.0	0.0	579.9
0G39BGB6	Support PISA Geology Section	3.0	2.7	1.5	3.7	10.7	18.3	4.9	0.1	0.0	0.0	0.0	0.0	45.0
12392142U1	SDD - Geology Chapter	3.0	2.7	1.5	3.7	10.7	18.3	4.9	0.1	0.0	0.0	0.0	0.0	45.0
0G39BFB2	Develop PISA Chapter 3.5 (Hydrology)	20.5	20.8	27.0	31.0	46.2	28.8	19.0	21.0	0.0	0.0	0.0	0.0	214.3
12392142U2	SDD - Hydrology Chapter	20.5	20.8	27.0	31.0	46.2	28.8	19.0	21.0	0.0	0.0	0.0	0.0	214.3
0G39BFB4	Dev. Climate/Met. Site Desc.	29.5	42.0	51.5	28.4	34.7	37.8	44.4	-3.1	0.0	0.0	0.0	0.0	265.2
12392142U3	SDD - Climate/Meteorol. Chapter	29.5	42.0	51.5	28.4	34.7	37.8	44.4	-3.1	0.0	0.0	0.0	0.0	265.2
0G39BGB5	Support Devel. of PISA Geochem. Sectio	12.5	7.5	5.9	-2.9	5.7	6.6	9.4	9.0	0.0	0.0	0.0	0.0	53.8
12392142U4	SDD - Geochemistry Chapter	12.5	7.5	5.9	-2.9	5.7	6.6	9.4	9.0	0.0	0.0	0.0	0.0	53.8
0G39BGB6	Chapter Coord/Consol/Review	23.7	6.0	19.8	23.4	13.9	15.5	17.2	18.2	0.0	0.0	0.0	0.0	137.8
12392142U6	SDD - Coord/Consol/Review	23.7	6.0	19.8	23.4	13.9	15.5	17.2	18.2	0.0	0.0	0.0	0.0	137.8
0G39BFB2	SDD - Hydrology Chapter - Deferred	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
12392142UY	SDD- Hydrology Chapter - Deferred	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
0G32211GB4	USGS Support to 3-D Geo. Mod. Dev/Re	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
12392212U1	Input to 3-D Integrated Site Model	0.0	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
0G39BGA1	Support PR Input/Review	9.5	2.9	3.9	1.0	0.2	0.0	2.9	0.2	0.0	0.0	0.0	0.0	20.6
12392570U1	PR Review/Input	9.5	2.9	3.9	1.0	0.2	0.0	2.9	0.2	0.0	0.0	0.0	0.0	20.6
12392142		98.7	81.8	109.7	84.5	119.8	107.0	97.8	45.5	0.0	0.0	0.0	0.0	744.9
0G39BGA1C	Provide Regulatory Support	0.0	0.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
0G39BGA1F	Provide QA Implementation Support	9.3	11.7	27.4	13.6	10.4	14.8	12.1	7.2	0.0	0.0	0.0	0.0	106.6
0G39BGA2C	Provide Support for Dev/Rev of Reg Doc	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
12399090U1	Site Investigations Support	9.3	12.3	28.8	13.6	10.4	14.8	12.1	7.2	0.0	0.0	0.0	0.0	108.5
12399090		9.3	12.3	28.8	13.6	10.4	14.8	12.1	7.2	0.0	0.0	0.0	0.0	108.5
	1.2.3.9	108.0	94.1	138.5	98.2	130.2	121.8	110.0	52.7	0.0	0.0	0.0	0.0	853.5

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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
	1.2.3	702.0	761.2	841.6	949.2	1135.4	876.3	1406.1	880.3	0.0	0.0	0.0	0.0	7552.2
0G535GA1	Technical Data Coordination	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	0.0	0.0	0.0	0.0	279.1
12532186U1	Provide Technical Data Base Input	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	0.0	0.0	0.0	0.0	279.1
12532186		32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	0.0	0.0	0.0	0.0	279.1
	1.2.5.3	32.8	25.8	40.7	26.5	43.5	33.0	32.7	44.0	0.0	0.0	0.0	0.0	279.1
0G544GA1	Support to Performance Assessment	5.3	6.4	3.1	3.1	3.4	0.0	5.9	9.3	0.0	0.0	0.0	0.0	36.7
12541121U1	Support to Performance Assessment	5.3	6.4	3.1	3.1	3.4	0.0	5.9	9.3	0.0	0.0	0.0	0.0	36.7
0G541FA2	Provide Support to PA - Deferred	0.0	0.0	-0.7	0.0	0.0	0.0	0.7	4.9	0.0	0.0	0.0	0.0	4.9
12541121UY	Provide Support to Performance Asses	0.0	0.0	-0.7	0.0	0.0	0.0	0.7	4.9	0.0	0.0	0.0	0.0	4.9
12541121		5.3	6.4	2.4	3.1	3.4	0.0	6.6	14.2	0.0	0.0	0.0	0.0	41.5
	1.2.5.4	5.3	6.4	2.4	3.1	3.4	0.0	6.6	14.2	0.0	0.0	0.0	0.0	41.5
	1.2.5	38.1	32.2	43.1	29.6	46.9	33.0	39.3	58.2	0.0	0.0	0.0	0.0	320.6
0G825GA1	Safety & Health	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	0.0	0.0	0.0	0.0	62.9
12829121U1	Federal Occupational Safety & Health	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	0.0	0.0	0.0	0.0	62.9
12829121		8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	0.0	0.0	0.0	0.0	62.9
	1.2.8.2	8.3	6.3	8.2	8.1	7.0	7.9	7.6	9.4	0.0	0.0	0.0	0.0	62.9
0G84GA2	Rad Water Quality Sample Collection	15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	0.0	0.0	0.0	0.0	37.6
12842086U1	Rad Water Quality Sample Collection	15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	0.0	0.0	0.0	0.0	37.6
12842086		15.7	-4.5	-1.4	0.7	5.8	9.3	4.2	7.9	0.0	0.0	0.0	0.0	37.6
0G847GB1	Water Resources	0.0	44.0	21.3	29.8	17.0	115.6	24.1	29.8	0.0	0.0	0.0	0.0	281.7
12849121U1	Water Resources	0.0	44.0	21.3	29.8	17.0	115.6	24.1	29.8	0.0	0.0	0.0	0.0	281.7
12849121		0.0	44.0	21.3	29.8	17.0	115.6	24.1	29.8	0.0	0.0	0.0	0.0	281.7
	1.2.8.4	15.7	39.5	19.9	30.5	22.8	125.0	28.3	37.7	0.0	0.0	0.0	0.0	319.3
	1.2.8	24.0	45.8	28.1	38.5	29.8	132.9	35.8	47.1	0.0	0.0	0.0	0.0	382.2
0G9121GA	Technical Project Office	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	0.0	0.0	0.0	0.0	281.3
12919135U1	USGS Project Management	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	0.0	0.0	0.0	0.0	281.3
12919135		28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	0.0	0.0	0.0	0.0	281.3
	1.2.9.1	28.8	28.7	38.4	32.4	33.1	38.2	44.2	37.5	0.0	0.0	0.0	0.0	281.3
0G922GA	Participant Project Control	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	0.0	0.0	0.0	0.0	180.0
12929135U1	Project Control - USGS	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	0.0	0.0	0.0	0.0	180.0
12929135		25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	0.0	0.0	0.0	0.0	180.0

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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
	1.2.9.2	25.2	24.0	26.4	15.0	21.8	22.9	22.5	22.1	0.0	0.0	0.0	0.0	180.0
	1.2.9	54.0	52.7	64.9	47.4	54.9	61.1	66.7	59.5	0.0	0.0	0.0	0.0	461.3
0GC522GA1	Satellite Records Operations	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	0.0	0.0	0.0	0.0	29.9
12C59130U1	USGS Satellite Records Operations	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	0.0	0.0	0.0	0.0	29.9
12C59130		4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	0.0	0.0	0.0	0.0	29.9
	1.2.12.5	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	0.0	0.0	0.0	0.0	29.9
	1.2.12	4.0	3.0	3.8	3.8	3.4	3.7	3.6	4.6	0.0	0.0	0.0	0.0	29.9
0GF23GA1	Support/Personnel Services	44.6	42.2	12.4	32.1	32.5	37.2	35.4	39.2	0.0	0.0	0.0	0.0	275.6
0GF23GA5	Procurement & Property Management	4.5	7.8	7.7	5.2	6.8	8.6	9.1	9.7	0.0	0.0	0.0	0.0	59.5
12F29110U1	Personnel/Procurement/Property Servi	49.1	49.9	20.1	37.4	39.2	45.9	44.5	49.0	0.0	0.0	0.0	0.0	335.1
0GF23GA2	Facilities Management (space)	0.0	123.3	61.7	61.7	61.7	44.7	58.8	58.8	0.0	0.0	0.0	0.0	470.7
0GF23GA3	Facilities Management (computers/phone	0.0	36.3	18.2	18.2	18.2	13.2	17.3	17.3	0.0	0.0	0.0	0.0	138.7
0GF23GA4	Facilities Management (other)	0.0	19.7	9.8	9.8	9.8	7.3	9.4	9.4	0.0	0.0	0.0	0.0	75.3
12F29110U2	Facilities Management (USGS)	0.0	179.3	89.7	89.7	89.7	65.2	85.6	85.6	0.0	0.0	0.0	0.0	684.7
12F29110		49.1	229.3	109.8	127.0	128.9	111.0	130.1	134.6	0.0	0.0	0.0	0.0	1019.8
	1.2.15.2	49.1	229.3	109.8	127.0	128.9	111.0	130.1	134.6	0.0	0.0	0.0	0.0	1019.8
0GF3GA1	USGS Training Support	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	0.0	0.0	0.0	0.0	33.3
12F39110U1	USGS Training Support	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	0.0	0.0	0.0	0.0	33.3
12F39110		4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	0.0	0.0	0.0	0.0	33.3
	1.2.15.3	4.4	3.3	4.7	4.3	3.6	4.0	4.9	4.1	0.0	0.0	0.0	0.0	33.3
	1.2.15	53.5	232.6	114.4	131.3	132.5	115.0	135.1	138.7	0.0	0.0	0.0	0.0	1053.1
1.2 OPERATING		911.4	1152.8	1168.7	1232.7	1443.0	1291.7	1698.0	1227.3	0.0	0.0	0.0	0.0	10125
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	1291.7	1698.0	1227.3	0.0	0.0	0.0	0.0	10125.7
FTEs														
FEDERAL		111.7	90.6	104.7	97.4	86.4	94.9	98.4	105.4	0.0	0.0	0.0	0.0	
CONTRACT		31.5	29.4	36.1	28.3	31.4	34.7	37.7	28.3	0.0	0.0	0.0	0.0	
	TOTAL	143.2	120.0	140.8	125.7	117.8	129.6	136.0	133.7	0.0	0.0	0.0	0.0	