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OVERNIGHT MAIL

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SUBMITTAL OF PARTICIPANTS' MONTHLY STATUS REPORTS

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 reports on a regular basis. Enclosed is the U. S. Geological Survey Progress Report for August, 1996

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

for Stephan J. Brocoum
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Suitability and Licensing

AMSL:AVG-2756

Enclosure: (NOT RECORD MATERIAL)
U.S. Geological Survey Monthly
Status Report for August, 1996

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U.S. GEOLOGICAL SURVEY

EXECUTIVE SUMMARY
August 1996

WBS 1.2.3.1 Coordination and Planning

U.S. Geological Survey-Yucca Mountain Project Branch is currently processing 198 scientific papers prepared by USGS authors. Of these, 68 are related to hydrologic studies and 130 to geologic studies. In addition, 49 abstracts by USGS authors are being processed, as well as 17 reports from LBL.

WBS 1.2.3.2 Geology

Geologic Framework

Sections on stratigraphy and structure were completed by project scientists for inclusion in the report on the hydrology of the unsaturated zone of the North Ramp ESF. In the stratigraphy section, selected elements of the existing 3-D lithostratigraphic model of the central block of Yucca Mountain were applied in evaluating the spatial characteristics of the hydrogeologic framework. The model database contains 74 boreholes, and there are 13 modeled lithostratigraphic units within the Tiva Canyon, Yucca Mountain, Pah Canyon, Topopah Spring, and Prow Pass Tuffs with 8 block- and subblock-bounding faults. Three cross sections, showing lateral changes in thickness and orientation of the lithostratigraphic units, were also extracted from the 3-D geologic model of the central block of Yucca Mountain to illustrate several geometric relations that are fundamental to interpretations regarding perched water and other hydrologic features in the North Ramp ESF area.

In the structure section for the report on the hydrology of the unsaturated zone of the North Ramp ESF, descriptions of the dominant fault trends and fracture patterns along and adjacent to the ESF are given, particularly with regard to the nonwelded hydrologic and thermo-mechanical unit (PTn) within the Paintbrush Group which is exposed locally in this area and was also encountered in the ESF. Understanding the controls on PTn fracture network geometry, intensity, and connectivity is an integral part of hydrologic and structural investigations at Yucca Mountain, because fractures developed within this important hydrogeologic unit could significantly influence flow paths and increase vertical flow rates through it. In the ESF, the PTn exposures are observed to have much lower fracture densities than in outcrops. Nearly all discontinuities are minor faults with dips less than 75 degrees and dip-slip displacements less than 1 m. These small faults are generally not distinguishable at the surface due to lack of exposure or lack of suitable stratigraphic markers, or because such minor displacements are accommodated within the fracture network before reaching the surface. Precision in the correlation of surface features with the subsurface is thus found to decrease with depth.

A completed report, "Interpretive geophysical fault map across the central block of Yucca Mountain, Nevada" (USGS Open-File Report 96-285, Milestone 3GGU132M) discusses geophysical data collected along 29 traverses across Yucca Mountain. Included in the report are two interpretive geophysical fault maps, based on gravity, ground magnetic and aeromagnetic surveys combined with geologic mapping, that depict possible fault locations or changes in the physical properties of the Tertiary volcanic bedrock. Although major block-bounding faults (e.g., Bow Ridge and Paintbrush Canyon faults) can be traced from one profile to another, locations of most faults cannot be precisely identified because of the severe magnetic terrain effects along the east flank of Yucca Mountain. Despite limitations, the magnetic and gravity data show that (1) Midway Valley, in addition to known faults, also contains heretofore unrecognized faults; (2) the central part of the east flank of Yucca Mountain is characterized by

numerous low-amplitude anomalies that probably reflect small-scale faults; and (3) the existence of a northwest-trending fault in Yucca Wash is equivocal. Combined geologic and geophysical (seismic reflection) data indicate that the Crater Flat-Yucca Mountain structural domain is an asymmetric fault-bounded half-graben having a maximum depth of about 4 km and a width of about 25 km.

The 1:6,000-scale bedrock geologic map, structure sections, and an accompanying text that describes the rock units and faults that were mapped across the central block of Yucca Mountain have been completed and submitted as a USGS administrative report (Milestone 3GGF204M). The major faults and their attendant splays can be generalized into three main groups based on their orientation: (1) north-striking block-bounding normal faults (e.g., Solitario Canyon and Bow Ridge faults), (2) northwest-striking strike- and oblique-slip faults (e.g., Pagany Wash and Drill Hole Wash faults), and (3) intrablock faults (e.g., Ghost Dance fault). The relative timing of the north-striking and northwest-striking feature is variable. The most common relationship in the northern part of the central block is that northwest-striking faults are cut by the north-striking faults. However, in some cases the timing of displacements was reversed, and in the southeastern part of the block several of the north-striking faults merge into northwest-striking faults, indicating coeval development.

Based on the results of the detailed mapping, the structures of northern Yucca Mountain are interpreted to have formed in response to east-west to southeast-northwest extension accompanied by dextral deformation distributed as clockwise vertical-axis rotation of the blocks bounded by the north-striking faults. The clockwise rotation of the fault blocks was accompanied by left (oblique) slip on several of the north-striking normal faults. On a local scale, the structures in the central block thus appear to be best explained in terms of a sinestral shear couple regime that developed within a regional pattern of dextral shear.

A synthesis report discussing the results and interpretations of fracture studies conducted in the Yucca Mountain area over the past 15 years was submitted as a USGS Administrative Report. The accumulated data, primarily involving tuffs within the Miocene Paintbrush Group, are being used in: (1) interpretations of the tectonic history of Yucca Mountain, (2) construction of simulated three-dimensional fracture network models, (3) development of surface infiltration models, and (4) determination of the effects of the fracture network on the stability of the rock mass during and after construction of the potential repository. Integration and analysis of more than 10,000 fracture measurements (from non-borehole sources alone) lead to the conclusion that fracture intensity is primarily dependent on lithology, variations in degree of welding, and proximity to faults.

In the continuing effort to provide revised lithostratigraphic contacts for use in 3-D geologic framework modeling, staff of the stratigraphic studies project completed a reexamination of the first group of 10 boreholes, and a revision of contacts for a second group of 12 boreholes is nearly completed and awaiting final review. Definition and correlation of lithostratigraphic contacts are based on drill cuttings and available geophysical logs, particularly including calculated porosity and water-saturation profiles.

Geologic mapping of the ESF was accomplished as follows: (1) full periphery geologic mapping was completed to station 62+38, (2) detailed line survey was completed to station 62+50.25, and (3) stereophotography was completed to station 62+71. Technical and QA reviews were conducted on maps and data packages for various sections of the ESF. A report on the geology of the North Ramp, stations 4+00 through 27+100 is in review. Staff involved in ESF mapping participated in tours of the ESF for representations of NRC, DOE, and NWTRB.

Several of the staff involved in geologic framework studies prepared abstracts of oral presentations to be given at the 1996 annual meeting of the Geological Society of America in Denver, CO, October 28-31. The subjects of the talks are: (1) Structural evolution of the potential high-level nuclear waste repository site at Yucca Mountain, Nevada: (2) Detailed bedrock geologic map of the central block area, Yucca Mountain - implications for structural development of the potential high-level radioactive waste repository area in Nye County, Nevada; (3) Correlation between surface and subsurface features at Yucca Mountain, Nye County, Nevada; (4) New thoughts on extensional models for the Basin and Range province based on crustal-scale seismic reflection profiles near Yucca Mountain, Nevada; and (5) Integrated geophysical interpretation of the subsurface structural fabric beneath Yucca Mountain, Nevada.

Seismotectonic Studies

Staff geologists mapped in detail and completed trench logs of the western end of Trench 5 that intersects the western splay (?) of the Ghost Dance fault at the northern base of Antler Ridge. This work was in response to concerns that had arisen over the significance of young-looking Quaternary-age material that appears to infill a fracture. No apparent offset of Quaternary units was observed, which indicates that the fracturing may have been induced by an event that took place on a fault other than the Ghost Dance in this area. The Trench 5 site was visited by members of the NWTRB resulting in a recommendation that an additional trench be excavated a few meters south of the existing trench for additional evidence as to the origin of the fracturing and to possibly provide more reliable information on whether or not there was Quaternary activity on the Ghost Dance fault.

Staff scientists involved in seismotectonic studies at Yucca Mountain assisted in organizing a symposium, entitled "Neogene and Quaternary geology of the Yucca Mountain region, Nevada, and its relevance to long-term nuclear waste isolation" to be given at the 1996 annual meeting of the Geological Society of America in Denver, CO, October 28-31. Scheduled for oral presentation at the symposium are sixteen papers on a wide variety of subjects bearing on the general theme of the Quaternary history of sedimentation, tectonism, and seismicity in the Yucca Mountain area and region. Abstracts of papers to be given by staff personnel were prepared with the following titles: (1) Geophysical domains of the Nevada Test Site region and applications to regional hydrology; (2) Choosing a tectonic model for Yucca Mountain, Nevada; (3) Results of investigations of the potential for Quaternary faulting on the Ghost Dance fault, central Yucca Mountain, Nye County, Nevada; (4) Late Quaternary activity on the Furnace Creek fault, northern Death Valley, California; (5) Bare Mountain and Death Valley-Furnace Creek faults -- distinctly different Quaternary faults near Yucca Mountain; and (6) Comparison of late Tertiary and Quaternary slip rates on the Stagecoach Road and Windy Wash faults, Yucca Mountain, Nevada.

Staff participated in meetings that were held to plan for future activities of the expert teams involved in probabilistic seismic hazard analyses. Preparation of various faulting reports, based on manuscript materials incorporated in the synthesis report on the seismotectonic framework of Yucca Mountain, for issuance as milestone reports and for publication continued.

Regional Hydrology

Processing of QA records for instrument calibrations was continued. Work on the preparation of the data-package for submittal was continued. The data from the weather station was technically reviewed and changes are being incorporated into the data package. The data from the expanded network of tipping bucket precipitation gages was prepared and is being technically reviewed.

Data was collected from the tipping bucket network. Analysis of precipitation amounts and intensities measured using the tipping bucket network was continued.

Routine maintenance was made on the three streamflow-gaging stations located along Fortymile Wash. Project staff kept vigilance during the month for potential precipitation and runoff associated with several storms that tracked through the southern Nevada area. Runoff was neither observed nor reported during the reporting period for the three gages or for the Yucca Mountain area.

Tables of the streamflow and precipitation data collected during Water Year 1995 were submitted to the Yucca Mountain Project Branch. The tables are planned for inclusion in Nevada District's annual water-resources data publication. Submittal of the tables completes Milestone 3GRS600M.

The report on FY1995 streamflow and precipitation data and the associated data records package is delayed because all of the 1995 streamflow and precipitation data and supporting information has not been returned by the Nevada District Data Section. The delays have resulted from reassignment of project personnel, electronic data processing problems, and backlogs associated with District staff review of the continuous and peak-discharge surface-water

data. The completion date for this activity has been rescheduled for the end of September, which should allow for sufficient time to prepare the data package and submit them for further USGS processing.

Because of operational delays in the drilling and rig support, USW G-2 tests were not completed on time. Management discussions are under way concerning the future of the report.

The water-quality segment of the FY1995 Fortymile Wash data package was submitted for release.

Colleague reviews of the regional, saturated-zone modeling report were completed, authors responded to review comments, and the report was revised accordingly. The report was submitted to DOE satisfying Level 3 Milestone, 3GRM600M.

Members of the saturated-zone modeling unit met on August 29 to discuss updates for the framework model, procedures for the updates, and the timeframe for completing the summary memo and future updates.

Unsaturated Zone

Work was started to develop shallow infiltration flux maps from annual rainfall distribution maps for a dry year (1989) and a wet year (1993). These maps will not include the effects of rainfall distribution within a year. Data packages to support the net infiltration numerical model for Yucca Mountain are being assembled.

The two infiltration models (BUCKET and INFIL) which were developed and used in support of Level 3 Milestone, 3GUI623M, were combined into a single FORTRAN source code (INFIL), with the option of modeling infiltration at Yucca Mountain using either the simplified, but much faster, mass-balance approach (the BUCKET sub-model), or using the finite-difference approximation of Richards equation, which is much slower but allows a more detailed analysis of the redistribution of moisture through time and space. The source code was compiled and tested on a SUN workstation in an effort to achieve faster simulation run-times. Analysis of various simulation results using the BUCKET sub-model of the INFIL program and improved parameters defining the bedrock geology, including both matrix- and fracture-hydrologic properties, was continued. Validation tests using the BUCKET sub-model and the stochastic precipitation model, which provides input to the INFIL program, were developed and test results were obtained to support software qualification. Also, some modifications to the source code, software-validation testing, and final calibrations continue as part of the work being done for software qualification.

Writing of the first draft of the manuscript "Conceptual and numerical model of infiltration for the Yucca Mountain area, Nevada" was completed. The manuscript was submitted for technical review, which is still in progress. Quality assurance of the 4 FORTRAN programs supporting this milestone continued. A delay in this Milestone is a result of the following circumstances: 1) Unanticipated work loads created by unplanned technical reviews and contributions to other FY96 milestones which were given higher priority to 3GUI623M. 2) Unanticipated work loads created by Software Qualification procedures which were still under development at the time FY96 milestones were planned. 3) Unanticipated work loads regarding the completion of FY96 data packages and previous data packages supporting 3GUI623M caused by a reduction in resources supporting this work which occurred after FY95. 4) Unanticipated simulation run-times of up to 10 days for the faster option of the numerical-infiltration model, which were needed to obtain the required results for the area of the 3D site-scale model. The direction and allocation of available resources to the completion of software qualification and data packages supporting 3GUI623M has been given highest priority, and work is progressing in tandem with the technical reviews of the manuscript. Completion of the final manuscript is pending completion of technical reviews, modifications which may be needed in response to mandatory review comments, and modifications which may be needed following editorial and QA reviews.

Data updates for NRG-6, NRG-7a, UZ#4, UZ#5, UZ-7a and SD-12 thru August 15, 1996 were prepared and are currently in review.

Unsaturated-zone prototype holes at the HRFcontinued to be monitored on an on-going basis for the 58th month. Borehole data from these holes as well as NRG-7a, NRG-6, UZ#4, UZ#5, UZ-7a, and SD-12 were transferred to Denver, converted to engineering units, and archived to optical disk on a routine basis throughout the month. Daily EKES files were checked for any shelter activity. Sensor readings were checked daily as well for unusual occurrences, and any statistical outliers were flagged as such.

The cause of the unusual responses from instrument station 'D', at NRG-7a, located in the PTn (base of the Yucca Mountain Tuff) has been attributed to the drainage of fractures in the overlying Tiva Canyon Tuff allowing more direct communication of this instrument station with the outside atmosphere. Since the last monthly status report, water potentials have been slowly recovering to their pre-disturbance state (i.e. pre-May 9, 1996). There appears to be no correlation of the anomalous behavior of this instrument station with respect to construction activities in the ESF. Instrument malfunction has been completely ruled out as a possible explanation. Data indicate that the disturbance must have originated and propagated from above the instrument station via enhanced communication with the outside atmosphere. The oscillatory character of this disturbance has abated indicating that the pneumatic pressure in this station has re-equilibrated with the true ambient pressure of the surrounding formation. Data from this station will continue to be closely monitored because it probably represents the aftereffects of the unusually wet winters of 1993 and 1994. Activity completed.

In-situ borehole monitoring data report has been compiled and forwarded for technical data review. Report includes data for UZ-7a and SD-12 through April 30, 1996.

All comment/resolution issues for the North Ramp Hydrology report have been resolved. The report was submitted to USGS editorial review staff and to the USGS QA office for review during the last week of August. Next step is post-editorial and QA review clean-up.

Began preparation of data figures for the ESF main-drift hydrology report. Pressure, temperature, and water-potential data through August 15, 1996 for boreholes UZ7a, SD-12, SD-7, and NRG-7a will be included. This report was scheduled to be completed by July 5, 1996. The first draft of this report will probably not be ready for colleague review (3GUP665C) until sometime in late January or early February, 1997. Work on this report was originally scheduled to begin on December 7, 1995, but it should be noted that this original start date would have included only one month of data for UZ-7a, one week of data for SD-12, no data for SD-7 and no information from the main drift of the ESF making it impossible to satisfy the criteria requirements for the milestone. Completing this report earlier than February, 1997 will not be possible with projected staff losses in FY97. Impact of this delay on other project activities is not known, however delay of 3GUP665B will impact 3GUP665C, 3GUP665D, and 3GUP665M.

A report that includes in-situ borehole monitoring data for NRG-6, NRG-7a, UZ#4 and UZ#5 through March 10, 1996, has been compiled and forwarded for technical review. USGS editorial review comments of the Air-K Testing report have been received and are in the process of being incorporated into the final draft.

Prototype development for the preparation of a technical procedure to operate the ultracentrifuge continues, and preliminary sample measurements are being made. Calibration, maintenance and repair of supporting laboratory equipment is an ongoing process.

A letter report describing the results of pneumatic monitoring at SD-7 was transmitted to DOE and satisfied Milestone 3GUP669.

In the Air-K & Hydrochemistry Testing-North Ramp Alcoves study the purchase of parts and supplies for construction of ESF packer assemblies was completed. Two uninterrupted power supplies for use in ESF testing were selected and have been ordered. The close out calibrations for the pressure transducers, thermistors, power supplies, and data loggers have been completed. The only items not completed are the mass flow controllers; they have been sent to HIF and are expected to be completed in early September.

Analyses of 14CO2 age estimates for gas samples collected from RBT#1 and RBT#2 in the Upper Paintbrush Nonwelded Contact Alcove were completed. Analyses from both boreholes do not change uniformly with depth, but are widely scattered throughout the boreholes. It is likely that the variability seen is related to the fracture density encountered in the boreholes, although detailed interpretation of these data is not yet completed.

The Principal Investigators and support hydrologists are writing the North Ramp Alcoves Testing report. Drafts of the sections on air-permeability testing and matrix properties have been completed.

The North Ramp Perched Water Testing staff completed work on the interpretation of the occurrence of perched water and the magnitude of perched water bodies. The work was submitted to the TPO on August 30. No perched water was encountered in August.

In support of the ESF Moisture Dryout study the calibration of the heat dissipation probes is being continued. Field data loggers have been checked and downloaded.

Gas Circulation and Pneumatic Pathways staff worked towards completing data analyses and technical reports. Data through August 12 has already been submitted for review in preparation for submittal of the level 3 milestone report. Data collected through the end of September be prepared and submitted as soon as possible after September 30. Data analysis for the Gas Phase Circulation in the vicinity of the ESF synthesis report was completed when the report was submitted for colleague review. Technical review of the report is ongoing.

UZ Hydrochemistry staff participated in sample collection and analysis. Gas sample collection at UZ-14 is being delayed while waiting for approval of a Determination of Importance Evaluation from the State of Nevada.

Six cores from SD-7 were compressed to extract pore-water for chemical composition and carbon-isotopic analyses. Nine SD-12, five SD-9, three SD-7, and three NRG-7A core samples were distilled for tritium, deuterium and oxygen-18 analyses.

Thirty-four distilled and compressed water samples and five QA sample-splits were prepared and submitted for D/H and O-18 isotopic ratio analysis. Four compressed water samples and one known QA standard were prepared and shipped for anion and cation chemical analysis. Two sets of compressed porewater samples were prepared and shipped for C-14 analysis.

Twenty-nine UZ water samples (9 SD-7, 6 NRG-7A, 5 SD-12, and 9 SD-9) were prepared for tritium analysis, and twenty UZ water samples (9 SD-7, 3 NRG-7A, and 8 SD-9) have been counted for tritium concentration and the data have been reduced.

Thirteen CO2, CH4, O2, and N2 gas concentrations, from samples collected at SD-12, were measured with the gas chromatograph in the UZ Hydrochemistry laboratory. Thirteen CO2 samples, collected on zeolite pellets in stainless steel cylinders were degassed, transferred to storage cylinders, and shipped to the C-14 analysis.

Geochemical modeling for the UZ hydrochemistry synthesis report using NETPATH mass balancing program on perched waters (evolution of the water and their C-14 residence times) was worked out by the PI and other modeling experts. Chemical constraints and mineral phases which can produce the best results representative of the system were searched and modeled.

Gaseous-phase C-14 data are not available at this time. This is because gas sampling with the Seamist liner requires permission from State of Nevada. The permit is being reviewed by the State of Nevada. Action is ongoing to resolve the issue.

The report titled "Preliminary 3-Dimensional Discrete Fracture Model, Tiva Canyon Tuff, Yucca Mountain Area, Nye County, Nevada," was submitted to DOE for approval. Modifications are being made to the report to comply with requirements listed in the criteria statement.

Preliminary three-dimensional discrete fracture networks of the upper part of the Topopah Spring Tuff have been successfully simulated. Fracture orientation and spacing were "bootstrapped" directly from ESF fracture mapping. Twenty realizations were run (Monte Carlo simulations) for each of four different scaled cubes at 50 m, 100 m, 150 m, and 200 m on a side. Mapped intensities were matched with simulated intensities. Conductive intensities have been calculated from air-permeability data. The model will include stratigraphic units from the top of the Topopah Spring to the bottom of the middle non-lithophysal unit (tptpmn). Network and pathway analysis are complete. Rock block analyses are complete and have been transferred to LBL. This analysis calculates the length, area, and volume between fractures. The data are used as input into dual porosity simulation models. Preliminary flow simulations are nearly complete. A preliminary outline for the report has been completed, based on the design of the report for the Tiva Canyon Tuff and on findings previously described. A letter has been submitted to LBL that included tables of limited simulated outcomes of the number of fracture connections, connection probabilities, directional permeability, and permeability tensor calculations for Topopah Spring Tuff model.

Work continued on the report "A Conceptual Model of Unsaturated Zone Flow and Transport, Yucca Mountain, Nevada." This report summarizes the findings of many other studies on surface and subsurface hydrology, gas and aqueous chemistry, and geology in an attempt to create a consistent conceptual model of water and gas flow within the unsaturated zone. Although still in progress, some preliminary findings can be reported: (1) The upward vapor flux in the Topopah Spring Tuff that occurs as a result of vapor concentration differences caused by the geothermal gradient is on the order of 0.005 mm/yr. Therefore, condensation and subsequent drainage at these rates are unlikely to significantly enhance percolation rates greater than about 0.05 mm/yr. (2) Mass transport of vapor by diffusion at rates of 0.005 mm/yr would result in the transport latent heat at rates of 4.0 x 10-4 J s-1 m-2, which is approximately two orders of magnitude less than the total conductive heat flux estimated for much of Yucca Mountain. Therefore, this mechanism is unlikely to significantly affect temperature gradients in the Topopah Spring Tuff. (3) Because partial alteration to clays and zeolites has substantially reduced the permeability of many nonwelded units in the lower part of the unsaturated zone beneath Yucca Mountain, entry points for dissolved radionuclides to the saturated zone beneath Yucca Mountain may be restricted primarily to faults and to where permeable zones (such as the devitrified, partially welded zones of the Prow Pass and Bullfrog Tuffs) intercept the water table. Existing maps of the geology at the water table provide indications of where these entry points will occur. (4) Simple calculations were done to determine the potential magnitude of the flow velocity of water diverted at a sloping interface, such as the upper contacts of the densely welded, crystal-poor vitric zone of the Topopah Spring Tuff or the zeolitic facies of the Calico Hills Tuff. The calculations showed that pore water velocity 1km downdip from the edge of a subsurface "catchment" area could be on the order of km/yr, even if the diverted component of the flux were as little as 0.01 mm/yr.

Saturated Zone

Work continued on the effort to conduct hydraulic and tracer tests at the C-holes. The main part of the 3GWF650M data milestone (January - June 1996) was data from a short pump test in the Lower-Bullfrog / Tram in January 1996 that will be analyzed as an aquifer test, and from the 2/8/96 - 3/29/96 combined hydraulic / Tracer test in the same unit.

During August 1996, the data package--which had been split into two components, one containing concentrations of the iodide tracer, and another containing transducer pressures and temperatures, and discharge rates--was submitted for review.

The C-holes conservative tracer testing program of the USGS has been suspended temporarily while LANL conducts reactive tracer tests in the Lower-Bullfrog interval. LANL, in turn, is delayed in initiating their reactive tracer tests while the State of Nevada investigates an incidence of use of a gaseous tracer in the ESF which exceeded permit allowances.

The LANL NaI two-well partial-recirculation test, with UE-25 c#1 as the injection well and UE-25 c#3 as the pumping well, has not been successful, indicating that such a test with the reactive tracers lithium bromide and

microspheres would not be successful either. Therefore, a request has been submitted to the State of Nevada for the use of lithium bromide and microspheres in a two-well partial-recirculation test, with UE-25 c#2 as the injection well and UE-25 c#3 as the pumping well, because tracer connectivity has already been established between UE-25c #3 and UE-25c #2. This test was planned to start on 7/17/96, but the State of Nevada has deferred action on the request while it investigates an incidence of use of a gaseous tracer in the ESF in concentrations higher than authorized. This incidence affects tracer testing at the C-holes, because use of this gaseous tracer is governed by the same permit that governs use of liquid tracers at the C-hole complex.

After two to three weeks from the commencement of the above lithium bromide and microspheres test, the partial recirculation into UE-25 c#2 will be stopped, while the pumping continues from UE-25c #3. At that time, the conservative tracer testing program of the USGS will resume. A convergent tracer test, i.e., with no recirculation, will be conducted by continuing to pump UE-25c #3 and simultaneously injecting 3-Carbamoyl-2-Pyridone in UE-25c #1 and 2-6-difluoro-benzoic acid in UE-25c #2. This test would enable the determination of two sets of transport properties: one for the rock mass between UE-25 c#1 and UE-25 c#3, and the other for the rock mass between UE-25 c#2 and UE-25 c#3, both within the tested Lower Bullfrog interval of the saturated zone. USGS personnel continue to provide assistance to LANL personnel on various aspects of tracer testing at the C-holes, such as operation of the automated sampler, and operation of the computerized data acquisition system, as the need arises.

The 1996 routine water-level data network includes 28 zones in 22 wells to be measured manually on a quarterly schedule (manual measurements) and 3 zones in 2 wells to be measured hourly (transducer measurements). During the month of August 1996, 30 manual measurements were completed and eight zones in six wells were monitored hourly with transducer measurements. The monitoring included several wells: wells UE-25 p#1 and USW H-5 upper and lower zones -- the two wells and 3 zones of the 1996 network; well USW G-2 -- monitored since January 1996 in support of hydraulic testing of the well; wells UE-25 WT#3, UE-25 WT#14, and USW H-4 upper and lower zones -- these wells were instrumented during May 1996 in support of the testing being conducted at the C-hole complex. Continuous analog data were collected from two zones in one well (USW H-5 upper and lower zones) in order to monitor water-level responses to seismic events.

Real-time data were obtained from three zones in two wells (UE-25 p#1 and USW H-5 upper and lower zones) using DCP's and the data were monitored on a daily basis to look for water-level deviations and equipment malfunctions. Transducer data collection at well USW H-5 will be discontinued. Wells UE-25 WT#3, UE-25 WT#14, and USW H-4 will continue to be monitored hourly in support of the pumping of the C-holes. Well USW G-2 will continue to be monitored as long as the well is still recovering from a single-well aquifer test conducted during April 1996.

A draft copy of the report "Analysis of water-level data in Yucca Mountain area, Nevada, 1985-95" was submitted for colleague review. The report "Water levels in the Yucca Mountain area, Nevada, 1994," by R.P. Graves, Patrick Tucci, and R.L. Goemaat, was approved as USGS-OFR-95-757. The author has the report for final review and revision.

Work continues in the study to analyze the hydraulic properties of WT-series wells. Recovery data is still being collected from well USW G-2. Residual drawdown on August 26, 1996, 123 days following completion of the single-well pump test, was 1.87 feet. Project staff started compiling USW G-2 single-well aquifer test data for the data package which will cover all data collected after April 8, 1996. No testing of wells was done during August 1996.

Milestone 3GWF625M, "Analysis of hydraulic tests conducted in boreholes USW WT-10, UE-25 WT#12, and USW SD-7, 1995-96, Yucca Mountain, Nevada" by G.M. O'Brien, was completed. The report was submitted to the Chief, Yucca Mountain Project Branch on August 28, 1996, in compliance with the due at the end of August 1996.

The level-3 milestone "3GWF660M Results of Hydraulic/Conservative Tracer Tests at C-Wells," was completed and submitted to DOE on its due date, Friday, August 30, 1996. The report contains four principal parts: "Background", "Instrumentation", "Pumping Tests", and "Tracer Test".

Site SZ framework model staff continued working on a revised potentiometric-surface map for the model area. The effort included inclusion of seismic data into formats suitable for inclusion in the framework model.

A letter report documenting the status of the site saturated-zone, 3-D flow model was written and submitted to DOE on 8/22, completing this activity ahead of schedule. Work has continued on the calibration of the model, using simplified boundaries and hydraulic properties (without the parameter-estimation module). Recharge and discharge areas have been added to the model. Questions remain as to model run times using the original large model area and using the parameter-estimation module. However, significant progress has been made in speeding up model-run times. Some time has been spent in getting visualization software, obtained from LANL, running on local computers.

WBS 1.2.3.6 Climatology and Paleohydrology

Staff scientists completed and submitted synthesis reports entitled (1) "The climatic and hydrologic history of southern Nevada during the late Quaternary" (Milestone 3GCA102M), and (2) "Synthesis of ground-water discharge deposits near Yucca Mountain" (Milestone 3GQH671M). These reports describe in detail the results, interpretations, and conclusions of the studies conducted within the site characterization climate and Quaternary hydrology programs. A major conclusion drawn from the large and varied data sets that have been collected on the several kinds of aquatic and terrestrial fossils, alluvial fans and stream channel deposits, and several types of isotopes, and from a wide number of field stratigraphic observations, is that the combined data are compatible and do not lead to controversial interpretations.

The accumulated data show that the present southern Nevada climate exhibits an enormous precipitation deficit compared to earlier Quaternary time. As a consequence, marshes and wetlands are rare in this region at the present time. During the last and older glacial cycles, however, higher effective moisture supported higher water tables and increased runoff in most southern Nevada valleys. The growth and persistence of wetlands in the region are correlated to northern hemisphere summer insolation minima, associated with the last glacial cycle. Similarly, the eventual loss of wetlands is associated with a rise in the northern hemisphere insolation to its maximum value at 12 ka, and the retreat of the polar cell from the region.

Isotopic evidence from paleodischarge deposits 15 to 20 km down-gradient to the south and southwest of Yucca Mountain suggests that discharging water at paleospring sites represents regional ground waters rather than perched local systems, a conclusion that requires that the regional water table elevation fluctuated in the past as a response to the higher effective moisture availability during periods of wetter climates. One of the main results of the studies of paleodischarge deposits is recognition that higher regional water table elevations of as much as 100 m were common during the last two glacial cycles (60-10 ka and 170-100 ka), hence, it is likely that water table elevations will rise during subsequent future pluvial cycles.

Staff continued to prepare samples, study fossil assemblages, and conduct analyses of Owens Lake cores and other materials in efforts to provide higher resolution paleoclimate data for the past 500 ky; expected average resolution is one sample per 400 yr.

WBS 1.2.13.4.7 Water-Resources Monitoring

Staff measured ground-water levels at 29 sites and discharge at five springs and one flowing well. A malfunctioning pressure sensor was replaced at site AD-6 and new pressure-sensor system was calibrated. Ground-water data collected during July were checked and filed.

Staff continued to provide environmental program support. Necessary PC repairs and advantageous PC upgrades were discussed with YMPB and Kenrob personnel on August 1 and 13. A memorandum was received which indicated the general plans for SAIC's radiological ground-water sampling program and a request for USGS participation on August 5. USGS participation in that program was discussed with USGS-Nevada District managers and personnel. Managers for Sterling and Rayrock Mines were contacted, and grab samples were collected for USGS-SCP water-quality analyses at well VH-2 and site CF-2 in Crater Flat on August 14. Electronic files of selected water-level data were provided to DOE personnel on August 21. Changes to criteria for milestone completion were discussed with SAIC personnel on August 26.

Work on the summary monitoring report through CY95 continued as a data-records package was prepared and submitted to USGS-ESIP for further processing and forwarding to Records Center. The preparation of a draft report was completed and responses to reviews were completed. The draft report was submitted for colleague, discipline-specialist, and editorial reviews on August 21. Responses to the editorial review were completed on August 26.

Water-level data were not collected at site MV-1 because the well does not have an access tube to allow water-level measurements. Water levels will be obtained at that location only when project staff are notified that the pump installed in the well has been removed. Tentative plans by Rayrock Mines include drilling additional wells in northwest Crater Flat in early-mid 1997.

USGS Level 3 Milestone Report

October 1, 1995 - August 31, 1996

Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
SYNTHESIS OF HYDROGEOLOGIC UNIT/MATRIX PROPERTIE **Milestone Number:** 3GUP603M	5/30/96	9/10/96		
SURFICIAL DEPOSITS MAP SHEETS 14-17, 23-24 29-30 **Milestone Number:** 3GCH201M	6/28/96	8/30/96	8/30/96	
MOD FLOW IN UNSAT FRAC NET TOPOPAH SPRG UNIT ES **Milestone Number:** 3GUF604M	8/16/96	10/29/96		
SYSTHESIS GAS PHASE CIRCULATION IN THE ESF **Milestone Number:** 3GGP605M	8/28/96	9/27/96		
Characteristics of Fractures at Yucca Mtn, NV **Milestone Number:** 3GGF205M	8/30/96	8/29/96	8/29/96	
LETR RPT: REGIONAL GROUND-WATER FLOW MODELING **Milestone Number:** 3GRM600M	8/30/96	8/30/96	8/30/96	
SYSTHSIS OF UNSAT ZONE INFILTRATION YUCCA MTN AR **Milestone Number:** 3GUI623M	8/30/96	9/30/96		
LTR RPT: AIR PERMEABILITY & HYDROCHEMISTY IN ESF **Milestone Number:** 3GUS619M	8/30/96	11/29/96		
GEOLOGIC MAP OF YUCCA MOUNTAIN, NEVADA **Milestone Number:** 3GGF204M	8/30/96	8/27/96	8/27/96	

Deliverable	Due Date	Expected Date	Completed Date	Comments
PRELIMINARY FRACTURE MODEL, TIVA CYN, YUCCA MTN **Milestone Number:** 3GUF105MR1	8/30/96	9/6/96		
RPT: RESULTS OF AGE SAMPLING DETERMAINATION **Milestone Number:** 3GQH450M	8/30/96	9/30/96		
LTR: RSLTS HYDRA/CONSERVATIVE TRACER TST C-WELLS **Milestone Number:** 3GWF660M	8/30/96	8/30/96	8/30/96	
PRELIMIN SITE SATURATED-ZONE GRND-WTR FLOW MOD **Milestone Number:** 3GWM611M	8/30/96	8/22/96	8/22/96	
SYNTH QUAT RSP YM UNSAT & SAT HYDROL CLMT CHNG **Milestone Number:** 3GCA102M	8/30/96	8/30/96	8/30/96	
SUBSURFACE MINERAL RECORD OF PAST HYDROLOGY **Milestone Number:** 3GQH257MR1	8/30/96	9/6/96		
SYNTHESIS OF SELECTED PALEODISCHARGE SITES **Milestone Number:** 3GQH671M	8/30/96	8/30/96	8/30/96	
SYNTHESIS INTERMED UNSAT-ZONE HYDRCHEMSTRY AT YM **Milestone Number:** 3GUH607M	8/30/96	3/4/97		

USGS Level 4 Milestone Report

October 1, 1995 - August 31, 1996

Sorted by Baseline Date

Deliverable	Due Date	Expected Date	Completed Date	Comments
REVIEW DRAFT: IN-SITU MONITORING DATA PACKAGE **Milestone Number:** 3GUP661M	2/28/96	8/30/96	8/30/96	
DATA TO TDB/CRF:IN-SITU Bh MONITORING, 9/95-2/96 **Milestone Number:** 3GUP660M	3/28/96	9/30/96		
LTR RPT: SYSTHESIS OF TECTONICS MDLS FOR YM AREA **Milestone Number:** 3GTE610M	3/29/96	9/5/96		
ADMIN RPT: AIR-K TESTING IN SB Bh THRU FY95 **Milestone Number:** 3GUP610M	3/29/96	9/30/96		
MEMO: SUMM OF FY1995 DATA **Milestone Number:** 3GWH608M	3/29/96	9/30/96		
ADMIN RPT: DEATH VALLEY HYDROCHEMISTRY **Milestone Number:** 3GWH609M	3/29/96	9/30/96		
Compl Report: Surf Faulting in Basin/Range **Milestone Number:** 3GSS105M	4/29/96	9/5/96		
REVIEW DRAFT: CONCEPTUAL MODEL OF UZ HYDRO SYS **Milestone Number:** 3GUM603M	4/30/96	10/31/96		
REVIEW DRAFT:GAS PHASE CIRCULATION IN VIC OF ESF **Milestone Number:** 3GGP604M	5/1/96	8/27/96	8/27/96	
ADMIN REPORT: NORTH RAMP HYDROLOGY **Milestone Number:** 3GUP667M	5/13/96	9/30/96		
DATA TO CRF: FY95 SITE METEOROLOGY **Milestone Number:** 3GMM600M	5/31/96	9/30/96		
ADMIN RPT: STREAMFLOW & PRECIPITATION DATA, FY95 **Milestone Number:** 3GRS600M	5/31/96	8/30/96	8/30/96	

Deliverable	Due Date	Expected Date	Completed Date	Comments
DATA TO CRF: FY95 STREAMFLOW DATA **Milestone Number:** 3GRS602M	5/31/96	9/30/96		
REVIEW DRAFT: PALEOCLIMATE SYNTHESIS REPORT **Milestone Number:** 3GCA101M	6/28/96	8/26/96	8/26/96	
REV DRAFT:MDLNG FLOW UZ FRAC NTWRKS TSw UNIT ESF **Milestone Number:** 3GUF603M	6/28/96	9/30/96		
RVW DRAFT: INTERMEDIATE UZ HYDROCHEMISTRY AT YM **Milestone Number:** 3GUH606M	6/28/96	12/31/96		
MEMO TO TPO: CONCEPTUAL MODEL OF UZ HYDRO SYSTEM **Milestone Number:** 3GUM612M	7/31/96	11/13/96		
LETTER REPORT: PNEUMATIC DATA FROM SD-7 **Milestone Number:** 3GUP671M	8/1/96	8/12/96	8/12/96	
DATA TO CRF: ESF MAPS AND DATA **Milestone Number:** 3GGF600M	8/15/96	9/17/96		
LTR DESCRIBING HYDRAULIC PROP WT-SERIES WELLS **Milestone Number:** 3GWF625M	8/29/96	8/29/96	8/29/96	
LTR RPT: PALEO HYDR/CLIM SIGNIF OF SURF DEPOSITS **Milestone Number:** 3GCH103M	8/30/96	8/30/96	8/30/96	
LETTER REPORT: USW G-2 **Milestone Number:** 3GRG604M	8/30/96	8/20/96	8/20/96	
Compl Rpt: Charact Fault Displ for PSHA **Milestone Number:** 3GSS100M	8/30/96	9/5/96		
REVIEW DRAFT: IN-SITU MONITORING DATA PACKAGE **Milestone Number:** 3GUP662M	8/30/96	9/30/96		
MEMO TO TPO: RSLTS OF PERCHED-WATER TESTING **Milestone Number:** 3GUS600M	8/30/96	9/3/96		

Yucca Mountain Project
Variance Analysis Report

Entered on: 09/16/96 07:43 AM **Entered by:** Raye Arnold
WBS: 1.2.3.1.2
WBS Title: Participant Management and Integration
AM: JONES S. **OM:** STATTON T.
Subject: Cost/Schedule Variance Analysis

YMP Participant: USGS
Submitted by: Raye Arnold
Reporting Period: 08/96

Data:

Cumulative Cost Variance: ($-157K / -20.2%)
Cause:
The negative cost variance is due largely to the budget and funding being at below the minimum level to manage the USGS site program. Initial budgets indicated that a potential overrun of $426K was possible. This account was not funded at a level adequate even for basic staffing requirements, leaving no funding for supplies & materials, office machine maintenance, secretarial support, publications, vehicle support, etc. Additional funding of $50K was received via an Approved Funding Change, but because there was no change in scope, no C/SCR was required and therefore, this amount is not reflected in the BCWS.

Impact:
There is a projected cost overrun in this P&S account of approximately $170K (less the additional funding of $50K, resulting in a cost overrun of funding of $120K) at this time. Cost underruns have been identified elsewhere in WBS 1.2.3 offset this cost overrun.

Corrective Action:
All unbudgeted costs to this P&S account require TPO approval. Account is being closely monitored to minimize overruns. Staff time is being rebudgeted and charged to other WBS elements, as appropriate.

Cumulative Schedule Variance: ($0K / 0%)
Variances are within tolerance.

Variance at Complete: ($-170K / -20%)
See "Cumulative Cost Variance"

Approved:

- (●) No
- ( ) Tech. Mgr
- ( ) TPO
- ( ) Yes

Yucca Mountain Project
Variance Analysis Report

Entered on: 09/16/96 07:55 AM **Entered by:** Raye Arnold
WBS: 1.2.3.2.8.3.6
WBS Title: Probabilistic Seismic Hazards Analyses
AM: JONES S. **OM:** STATTON T.
Subject: Cost/Schedule Variance Analysis

YMP Participant: USGS
Submitted by: Raye Arnold
Reporting Period: 08/96

Data:

Cumulative Cost Variance: ($-70K / -51.1%)
Variances are within tolerance.

Cumulative Schedule Variance: ($0K / 0%)
Variances are within tolerance.

Variance at Complete: ($-96K / -64%)
Cause:
The negative variance at complete is due to the need to hire additional staff in order to complete the seismotectonic synthesis report level 3 milestone.

Impact:
There will be a cost overrun of approximately $96K in this P&S account; however, there are adequate projected cost underruns within the USGS 1.2.3 WBS element to offset these cost overruns. There will be no schedule variance; the milestone was completed by the due date of August 1, 1996.

Corrective Action:
Ensure adequate cost underruns within the third level WBS to cover this cost overrun.

Approved:

- (●) No
- ( ) Tech. Mgr
- ( ) TPO
- ( ) Yes

Yucca Mountain Project
Variance Analysis Report

Entered on: 09/16/96 07:57 AM **Entered by:** Raye Arnold
WBS: 1.2.3.2.8.4.6
WBS Title: Quaternary Faulting within the Site Area
AM: JONES S. **OM:** STATTON T.
Subject: Cost/Schedule Variance Analysis

YMP Participant: USGS
Submitted by: Raye Arnold
Reporting Period: 08/96

Data:

Cumulative Cost Variance: ($-5K / -1.8%)
Variances are within tolerance.

Cumulative Schedule Variance: ($0K / 0%)
Variances are within tolerance.

Variance at Complete: ($-76K / -25.3%)
Cause:
This negative variance at complete is projected due to significantly more field work being required than had been planned or funded this fiscal year. Additionally, $15K from this account was transferred to USBR to complete an FY1995 milestone report, 3GTQ530M, which was submitted on July 22, 1996. This was not part of the planned budget.

Impact:
There will be a cost overrun of approximately $76K in this P&S account; however, there are adequate projected cost underruns within the USGS 1.2.3 WBS element to offset these cost overruns.

Corrective Action:
Ensure adequate cost underruns within the third level WBS to cover this cost overrun.

Approved:

- (●) No
- ( ) Tech. Mgr
- ( ) TPO
- ( ) Yes

Yucca Mountain Project
Variance Analysis Report

Entered on: 09/16/96 08:00 AM **Entered by:** Raye Arnold
WBS: 1.2.3.3.1.3.1
WBS Title: Site Saturated Zone Ground-Water Flow System
AM: JONES S. **OM:** STATTON T.
Subject: Cost/Schedule Variance Analysis

YMP Participant: USGS
Submitted by: Raye Arnold
Reporting Period: 08/96

Data:

Cumulative Cost Variance: ($116K / 11.1%)
Cause:
This positive cost variance is due primarily to the cleanout of WT-12 requiring less time and resources than was budgeted for the effort.

Impact:
There is no schedule impact to this cost variance. Work was completed with less time and resources than budgeted. There is a projected cost underrun in this P&S account of approximately $91K at this time. These funds have been identified to help offset the projected overrun in other 1.2.3 P&S accounts.

Corrective Action:
No corrective action required. Projected underrun will be used to help offset projected overrun.

Cumulative Schedule Variance: ($3K / 0.3%)
Variances are within tolerance.

Variance at Complete: ($91K / 7.9%)
Variances are within tolerance.

Approved:
- (●) No
- ( ) Tech. Mgr
- ( ) TPO
- ( ) Yes

WBS No. - 1.2

WBS Title - Yucca Mountain Project

Parent WBS No. - 1.0

Parent WBS Title - Mined Geologic Disposal System

Element ID - 12

Statement of Work:

See the current WBS Dictionary

Cost/Schedule Performance

Id	Description	Current Period BCWS	BCWP	ACWP	SV	CV	FY1996 Cumulative to Date BCWS	BCWP	ACWP	SV	CV	FY1996 at Completion BAC	EAC	VAC
1.2.3	Site Investigations	1056	956	1216	-100	-260	11399	11194	11032	-205	162	12419	12567	-148
1.2.5	Regulatory	28	28	43	0	-15	335	335	303	0	32	365	357	8
1.2.8	Environment, Safety, and H	40	40	47	0	-7	471	472	458	1	14	515	512	3
1.2.9	Project Management	54	54	78	0	-24	608	608	586	0	22	664	663	1
1.2.12	Information Management	7	7	4	0	3	75	75	67	0	8	80	75	5
1.2.15	Support Services	155	155	148	0	7	1715	1715	1750	0	-35	1871	1882	-11
Total		1340	1240	1536	-100	-296	14603	14399	14196	-204	203	15914	16056	-142

Resource Distributions by Element of Cost

Fiscal Year 1996

Budgeted Cost of Work Scheduled

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	23259	23807	23340	23449	24069	25071	23358	27690	24694	23874	23805	23543	289959
LABOR	954	972	944	959	980	1021	955	1177	1032	1009	1008	1009	12020
SUBS	34	41	39	46	75	109	106	117	139	133	126	121	1086
TRAVEL	30	41	38	38	43	46	42	40	35	37	25	22	437
PM&E	25	18	23	37	35	29	27	35	30	19	15	4	297
OTHER	157	159	155	165	165	214	180	181	171	190	166	155	2058
CAPITAL	0	0	0	0	0	0	16	0	0	0	0	0	16
Total BCWS	1200	1231	1199	1245	1298	1419	1326	1550	1407	1388	1340	1311	15914

Actual Cost of Work Performed

LBRHRS	21987	21558	21063	22761	20217	20627	19331	21820	20636	22047	21999	0	234046
LABOR	825	785	801	909	860	867	816	977	883	963	987	0	9673
SUBS	56	72	97	111	118	170	188	220	170	195	165	0	1562
TRAVEL	8	43	29	26	40	60	25	52	56	33	27	0	399
PM&E	0	0	0	44	151	-20	48	66	39	83	107	0	518
OTHER	129	152	170	182	277	150	167	193	186	172	250	0	2028
CAPITAL	0	0	0	0	0	0	16	0	0	0	0	0	16
Total ACWP	1018	1052	1097	1272	1446	1227	1260	1508	1334	1446	1536	0	14196

WBS No. - 1.2 -Yucca Mountain Project

Resource Distributions by Element of Cost

Fiscal Year 1996
Estimate to Complete

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
LBRHRS	0	0	0	0	0	0	0	0	0	0	0	24259	24259
LABOR	0	0	0	0	0	0	0	0	0	0	0	1108	1108
SUBS	0	0	0	0	0	0	0	0	0	0	0	254	254
TRAVEL	0	0	0	0	0	0	0	0	0	0	0	43	43
PM&E	0	0	0	0	0	0	0	0	0	0	0	48	48
OTHER	0	0	0	0	0	0	0	0	0	0	0	407	407
CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ETC	0	0	0	0	0	0	0	0	0	0	0	1860	1860

Resource Distributions

Fiscal Year 1996	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
BCWS	1200	1231	1199	1245	1298	1419	1326	1550	1407	1388	1340	1311	15914
BCWP	1193	1238	1175	1189	1360	1402	1319	1518	1418	1347	1240	0	14399
ACWP	1018	1052	1097	1272	1446	1227	1260	1508	1334	1446	1536	0	14196
ETC	0	0	0	0	0	0	0	0	0	0	0	1860	1860

Fiscal Year Distribution

	Prior	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	Future	At Complete
BCWS	0	15914	0	0	0	0	0	0	0	0	0	0	15914
BCWP	0	14399	0	0	0	0	0	0	0	0	0	0	
ACWP	0	14196	0	0	0	0	0	0	0	0	0	0	
ETC	0	1860	0	0	0	0	0	0	0	0	0	0	16056

YMP PLANNING AND CONTROL SYSTEM (PACS)

Participant U.S. Geological Survey
Date Prepared 09/10/96 08:18

MONTHLY COST/FTE REPORT

Fiscal Month/Year AUGUST 1996

	CURRENT MONTH END						FISCAL YEAR		
WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCON HOURS	PURCHASE COMMITMENTS	SUBCON COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.2.3	1212	17820	3192	0	275	283	12534	12534	10988
1.2.5	41	492	336	0	25	0	365	365	301
1.2.8	47	754	0	0	0	0	515	515	457
1.2.9	78	1248	336	0	20	3	664	664	583
1.2.12	4	176	0	0	0	0	80	80	67
1.2.15	149	1509	336	0	11	25	1871	1871	1747
TOTALS	1531	21999	4200	0	331	311	16029	16029	14143

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR 10/1/95 - 08/31/96

		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
0G311968	Scientific Programs Management and Integ	13.9	15.6	15.2	17.0	29.6	30.6	29.7	30.7	19.4	18.5	16.0	0.0	236.2
1.2.3.1.1		13.9	15.6	15.2	17.0	29.6	30.6	29.7	30.7	19.4	18.5	16.0	0.0	236.2
0G312968Z	U.S. Geological Survey Support	79.6	93.3	92.1	107.4	174.8	34.2	66.3	78.7	24.1	60.1	124.2	0.0	934.8
1.2.3.1.2		79.6	93.3	92.1	107.4	174.8	34.2	66.3	78.7	24.1	60.1	124.2	0.0	934.8
*1.2.3.1		93.5	108.9	107.3	124.4	204.4	64.8	96.0	109.4	43.5	78.6	140.2	0.0	1171.0
0G32211D96	Compilation and Synthesis of Existing St	11.4	14.1	11.9	37.6	24.4	32.7	10.7	33.3	22.2	19.8	13.6	0.0	231.7
0G32211H96	Geophysical Investigations	3.5	0.1	0.0	0.0	0.8	-3.6	0.0	51.5	6.0	25.7	2.9	0.0	86.9
0G32211K96	Analysis of Pre 1985 Geophysical Logs	0.0	0.0	0.0	0.0	0.0	0.6	0.0	60.8	3.0	4.2	6.7	0.0	[illegible].3
1.2.3.2.2.1.1		14.9	14.2	11.9	37.6	25.2	29.7	10.7	145.6	31.2	49.7	23.2	0.0	[illegible].9
0G32212H96	Geologic Map of the Central Block of the	34.1	33.4	34.0	31.8	35.2	55.4	60.5	39.7	47.3	43.1	15.5	0.0	430.0
0G32212J96	Exploratory Studies Facility Mapping (US	111.3	100.7	135.7	183.3	192.8	244.4	157.1	165.7	253.0	266.9	321.6	0.0	2132.5
1.2.3.2.2.1.2		145.4	134.1	169.7	215.1	228.0	299.8	217.6	205.4	300.3	310.0	337.1	0.0	2562.5
0G32831A96	Summary of Geologic, Geophysical, and Se	5.9	6.3	5.9	6.5	6.9	5.9	6.8	40.6	12.5	17.1	1.8	0.0	116.2
1.2.3.2.8.3.1		5.9	6.3	5.9	6.5	6.9	5.9	6.8	40.6	12.5	17.1	1.8	0.0	116.2
0G32833A96	Coordination and Review of Ground Motion	0.0	11.5	24.0	14.0	24.1	-10.8	0.0	0.0	0.0	0.0	23.2	0.0	86.0
1.2.3.2.8.3.3		0.0	11.5	24.0	14.0	24.1	-10.8	0.0	0.0	0.0	0.0	23.2	0.0	86.0
0G32836A96	Seismotectonics Summary and Synthesis	7.8	16.6	14.2	16.7	16.9	12.4	10.7	17.8	14.2	19.7	60.3	0.0	207.3
1.2.3.2.8.3.6		7.8	16.6	14.2	16.7	16.9	12.4	10.7	17.8	14.2	19.7	60.3	0.0	207.3
0G32846A96	Quaternary Faulting at the Site	14.7	21.7	17.7	21.9	25.1	35.8	42.8	-0.2	28.0	30.6	-6.7	0.0	231.4
0G32846K96	Trench Samp Dates Quat. Flts Hist GD, RV	0.0	0.0	0.0	0.0	3.8	0.0	0.7	10.1	8.2	7.8	13.2	0.0	43.8
1.2.3.2.8.4.6		14.7	21.7	17.7	21.9	28.9	35.8	43.5	9.9	36.2	38.4	6.5	0.0	275.2
0G3284CC96	Prepare Final Report on Tectonic Models	18.2	5.8	10.3	7.0	7.9	7.7	6.4	14.1	14.5	15.7	-5.3	0.0	102.3
1.2.3.2.8.4.12		18.2	5.8	10.3	7.0	7.9	7.7	6.4	14.1	14.5	15.7	-5.3	0.0	102.3
*1.2.3.2		206.9	210.2	253.7	318.8	337.9	380.5	295.7	433.4	408.9	450.6	446.8	0.0	37[illegible].4
0G33111B96	Collection of Site Meteorological Data f	6.2	7.3	5.9	6.7	6.9	7.9	8.4	7.3	9.4	11.2	6.9	0.0	[illegible]
1.2.3.3.1.1.1		6.2	7.3	5.9	6.7	6.9	7.9	8.4	7.3	9.4	11.2	6.9	0.0	84.1
0G33112C96	Collection of Site Streamflow Data	7.0	19.4	9.6	10.2	8.3	4.4	1.1	3.3	5.1	4.9	6.7	0.0	80.0
1.2.3.3.1.1.2		7.0	19.4	9.6	10.2	8.3	4.4	1.1	3.3	5.1	4.9	6.7	0.0	80.0
0G33113A96	Assessment of Key Data/Modeling Problems	0.1	5.2	8.8	1.1	1.9	1.1	2.6	4.5	13.2	5.7	12.9	0.0	57.1
0G33113C96	Fortymile Wash Recharge	5.8	4.9	4.0	2.5	6.2	5.8	5.0	6.7	2.2	4.4	0.1	0.0	47.6
1.2.3.3.1.1.3		5.9	10.1	12.8	3.6	8.1	6.9	7.6	11.2	15.4	10.1	13.0	0.0	104.7
0G33114D96	Regional Saturated- Zone Numerical Model	7.1	6.2	1.5	2.7	10.4	24.6	6.0	28.9	32.0	20.0	13.3	0.0	152.7
0G33114E96	Regional Saturated- Zone Boundary Condit	5.0	12.5	12.2	15.5	4.3	3.4	-0.2	0.0	0.0	0.0	0.0	0.0	52.7
0G33114F96	Regional Saturated- Zone Framework Model	0.0	0.0	12.3	22.8	16.0	10.2	5.8	14.1	9.1	1.3	4.6	0.0	96.2
1.2.3.3.1.1.4		12.1	18.7	26.0	41.0	30.7	38.2	11.6	43.0	41.1	21.3	17.9	0.0	301.6
0G33121C96	Infiltration Distribution	7.8	9.5	9.0	11.3	11.2	8.2	9.7	5.7	4.6	0.5	3.8	0.0	81.3
0G33121D96	Infiltration Properties	5.7	6.7	5.7	9.9	11.0	5.8	6.2	10.0	6.8	10.1	8.6	0.0	86.5

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0G33121E96	Infiltration Processes	15.4	18.1	16.9	20.3	23.7	20.0	16.2	19.2	16.1	20.8	21.5	0.0	208.2
1.2.3.3.1.2.1		28.9	34.3	31.6	41.5	45.9	34.0	32.1	34.9	27.5	31.4	33.9	0.0	376.0
0G33123C96	Vertical Seismic Profiling: Borehole UE-	17.5	20.0	13.2	32.7	21.1	10.1	9.5	19.9	18.4	-9.5	15.9	0.0	168.8
0G33123D96	Unsaturated Zone Borehole Instrumentatio	74.8	82.1	66.5	38.2	57.3	41.1	49.5	55.1	45.8	71.3	58.4	0.0	640.1
0G33123G96	Integrated Analysis and Interpretation	0.0	0.0	12.4	12.9	15.3	16.7	17.1	16.1	13.9	10.9	16.6	0.0	131.9
0G33123H96	Matrix Properties of Hydrologic Units	12.2	9.3	9.4	7.2	7.7	7.2	6.1	14.4	11.3	13.4	15.6	0.0	113.8
0G33123K96	Temporary Instrumentation of SD-7	0.0	0.0	0.0	4.6	6.6	5.8	7.5	10.2	6.3	-2.7	0.5	0.0	38.8
1.2.3.3.1.2.3		104.5	111.4	101.5	95.6	108.0	80.9	89.7	115.7	95.7	83.4	107.0	0.0	1097
0G33124E96	Air-Permeability and Hydrochemistry Test	29.5	33.8	37.6	42.4	56.3	24.9	41.2	29.1	49.6	43.4	59.3	0.0	447
0G33124F96	Perched Water Testing in the Exploratory	0.9	0.0	2.8	4.3	3.0	1.0	12.4	22.0	-12.8	4.4	0.4	0.0	38.4
0G33124K96	ESF Moisture/Dryout	0.0	0.0	0.0	0.0	7.0	7.5	12.9	18.3	12.6	21.4	6.0	0.0	85.7
1.2.3.3.1.2.4		30.4	33.8	40.4	46.7	66.3	33.4	66.5	69.4	49.4	69.2	65.7	0.0	571.2
0G33126B96	Gas Circulation and Pneumatic Pathways	9.6	11.5	9.0	13.7	9.6	8.9	8.7	10.3	11.7	8.0	11.4	0.0	112.4
1.2.3.3.1.2.6		9.6	11.5	9.0	13.7	9.6	8.9	8.7	10.3	11.7	8.0	11.4	0.0	112.4
0G33127B96	Unsturated-Zone Hydrochemistry	26.2	26.4	32.2	23.4	53.2	18.3	46.8	28.9	28.7	30.4	22.1	0.0	336.6
1.2.3.3.1.2.7		26.2	26.4	32.2	23.4	53.2	18.3	46.8	28.9	28.7	30.4	22.1	0.0	336.6
0G33128A96	Fluid Flow in Unsaturated-Zone Fractured	6.9	6.9	6.6	7.2	8.4	8.8	9.3	15.3	9.3	10.3	30.0	0.0	119.0
1.2.3.3.1.2.8		6.9	6.9	6.6	7.2	8.4	8.8	9.3	15.3	9.3	10.3	30.0	0.0	119.0
0G33129B96	Intermediate Site Unsaturated-Zone FlowM	7.3	8.6	15.2	30.5	6.3	16.6	17.7	23.0	1.8	7.8	8.2	0.0	143.0
1.2.3.3.1.2.9		7.3	8.6	15.2	30.5	6.3	16.6	17.7	23.0	1.8	7.8	8.2	0.0	143.0
0G33131A96	Conduct Hydraulic/Tracer Tests, C-Wells	39.6	40.5	40.7	49.0	57.6	7.2	10.1	8.6	0.9	23.2	33.0	0.0	310.4
0G33131F96	Site Potentiometric Levels Monitoring	11.7	17.5	17.2	0.4	3.7	10.3	10.8	16.8	3.5	14.1	9.8	0.0	115.8
0G33131G96	Pumping and Testing Existing Monitoring	11.8	14.0	5.4	20.7	20.8	21.4	31.8	17.6	43.7	27.3	7.0	0.0	221.5
0G33131K96	Enhanced C-Wells Hydraulic and Conservat	0.0	0.0	0.0	0.0	0.0	51.2	42.1	52.1	45.6	50.5	40.6	0.0	282.1
1.2.3.3.1.3.1		63.1	72.0	63.3	70.1	82.1	90.1	94.8	95.1	93.7	115.1	90.4	0.0	929
0G33132D96	Saturated-Zone Hydrochemical Sample and	6.7	6.9	6.3	8.7	6.9	6.9	7.4	7.0	0.6	0.0	0.0	0.0	57.4
1.2.3.3.1.3.2		6.7	6.9	6.3	8.7	6.9	6.9	7.4	7.0	0.6	0.0	0.0	0.0	57.4
0G33133D96	Site Saturated Zone Framework Model	14.9	10.2	4.6	0.1	0.1	0.7	11.2	16.7	10.1	10.4	11.0	0.0	90.0
0G33133E96	Site Saturated Zone Numerical Model	11.5	10.1	3.3	13.4	17.4	21.1	15.2	22.0	14.8	14.3	31.7	0.0	174.8
1.2.3.3.1.3.3		26.4	20.3	7.9	13.5	17.5	21.8	26.4	38.7	24.9	24.7	42.7	0.0	264.8
*1.2.3.3		341.2	387.6	368.3	412.4	458.2	377.1	428.1	503.1	414.3	427.8	455.9	0.0	4574.0
0G3521968	Tracer Gas Support	5.2	5.2	5.1	5.4	5.4	5.5	5.3	5.9	5.0	5.7	5.4	0.0	59.1
1.2.3.5.2.1		5.2	5.2	5.1	5.4	5.4	5.5	5.3	5.9	5.0	5.7	5.4	0.0	59.1
*1.2.3.5		5.2	5.2	5.1	5.4	5.4	5.5	5.3	5.9	5.0	5.7	5.4	0.0	59.1
0G36212B96	Paleoclimate Study of Lake, Playa and Ma	21.0	18.3	14.8	25.4	23.3	29.2	16.0	-29.7	5.1	9.7	6.1	0.0	139.2
1.2.3.6.2.1.2		21.0	18.3	14.8	25.4	23.3	29.2	16.0	-29.7	5.1	9.7	6.1	0.0	139.2
0G36214A96	Geochronological Studies of Surface Desp	22.4	16.3	17.1	3.4	0.9	-10.3	11.2	9.5	8.4	12.3	4.2	0.0	95.4

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0G36214B96	Surface Deposits Mapping	5.9	5.9	6.2	7.2	8.0	7.2	10.1	12.3	6.2	7.3	8.0	0.0	84.3
1.2.3.6.2.1.4		28.3	22.2	23.3	10.6	8.9	-3.1	21.3	21.8	14.6	19.6	12.2	0.0	179.7
0G36215A96	Paleoclimate/Paleoenvironmental Synthesi	9.1	9.1	15.4	3.3	13.8	8.9	13.5	33.0	11.5	21.8	19.8	0.0	159.2
1.2.3.6.2.1.5		9.1	9.1	15.4	3.3	13.8	8.9	13.5	33.0	11.5	21.8	19.8	0.0	159.2
0G36221E96	Subsurface Mineral Record of Past Hydrol	16.9	36.8	25.6	27.0	18.8	28.2	21.4	-3.4	6.8	-5.2	16.9	0.0	189.8
0G36221F96		0.0	0.2	4.5	12.2	16.5	8.1	8.4	35.7	17.1	24.8	17.0	0.0	144.5
0G36221G96	Evaluation of Paleo Ground-Water Dischar	9.5	4.1	-0.7	0.0	1.7	4.2	14.9	60.2	30.6	20.6	20.5	0.0	165.6
0G36221K96	Dating of Fracture Coatings in ESF	0.0	0.0	24.3	50.5	86.9	53.0	31.3	34.4	50.0	60.9	71.0	0.0	462
1.2.3.6.2.2.1		26.4	41.1	53.7	89.7	123.9	93.5	76.0	126.9	104.5	101.1	125.4	0.0	962
*1.2.3.6		84.8	90.7	107.2	129.0	169.9	128.5	126.8	152.0	135.7	152.2	163.5	0.0	1440.3
**1.2.3		731.6	802.6	841.6	990.0	1175.8	956.4	951.9	1203.8	1007.4	1114.9	1211.8	0.0	10987.8
0G52496B2	Regulatory Documentation	5.7	5.9	0.0	8.9	0.9	0.0	0.0	-5.0	11.2	0.3	0.0	0.0	27.9
1.2.5.2.4		5.7	5.9	0.0	8.9	0.9	0.0	0.0	-5.0	11.2	0.3	0.0	0.0	27.9
*1.2.5.2		5.7	5.9	0.0	8.9	0.9	0.0	0.0	-5.0	11.2	0.3	0.0	0.0	27.9
0G53596B	Technical Data Base Input	7.2	10.3	12.5	14.1	11.8	13.1	20.8	21.4	17.5	19.9	23.5	0.0	172.1
1.2.5.3.5		7.2	10.3	12.5	14.1	11.8	13.1	20.8	21.4	17.5	19.9	23.5	0.0	172.1
*1.2.5.3		7.2	10.3	12.5	14.1	11.8	13.1	20.8	21.4	17.5	19.9	23.5	0.0	172.1
0G54196B	Interact with Site Characterization and	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	3.5	-5.4	0.0	9.2
1.2.5.4.1		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	3.5	-5.4	0.0	9.2
0G54696B	Planning and Coordination of Flow- and-T	0.0	0.0	0.4	10.2	-3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	7.8
1.2.5.4.6		0.0	0.0	0.4	10.2	-3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	7.8
*1.2.5.4		0.0	0.0	0.4	10.2	-3.1	0.3	0.0	0.0	11.1	3.5	-5.4	0.0	17.0
0G55396B		0.0	0.0	0.0	0.1	-0.1	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.5
1.2.5.5.3		0.0	0.0	0.0	0.1	-0.1	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.5
*1.2.5.5		0.0	0.0	0.0	0.1	-0.1	0.3	0.0	0.2	0.0	0.0	0.0	0.0	
0G5796B	Technical Evaluation	0.9	0.0	0.0	0.9	0.5	-0.2	0.0	15.9	25.3	16.1	23.3	0.0	82.7
1.2.5.7		0.9	0.0	0.0	0.9	0.5	-0.2	0.0	15.9	25.3	16.1	23.3	0.0	82.7
*1.2.5.7		0.9	0.0	0.0	0.9	0.5	-0.2	0.0	15.9	25.3	16.1	23.3	0.0	82.7
**1.2.5		13.8	16.2	12.9	34.2	10.0	13.5	20.8	32.5	65.1	39.8	41.4	0.0	300.2
0G82596B	Occupational Safety and Health	7.3	7.4	7.0	7.7	7.8	7.5	7.5	10.8	10.1	11.8	9.5	0.0	94.4
1.2.8.2.5		7.3	7.4	7.0	7.7	7.8	7.5	7.5	10.8	10.1	11.8	9.5	0.0	94.4
*1.2.8.2		7.3	7.4	7.0	7.7	7.8	7.5	7.5	10.8	10.1	11.8	9.5	0.0	94.4
0G84596B	Radiological Studies	0.0	0.0	0.0	0.1	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
1.2.8.4.5		0.0	0.0	0.0	0.1	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.3
0G84796H	Water Resources Monitoring	33.3	26.9	27.4	27.8	31.9	31.6	39.8	32.8	36.4	37.3	37.3	0.0	362.5
1.2.8.4.7		33.3	26.9	27.4	27.8	31.9	31.6	39.8	32.8	36.4	37.3	37.3	0.0	362.5
*1.2.8.4		33.3	26.9	27.4	27.9	31.9	31.2	39.8	32.8	36.4	37.3	37.3	0.0	362.2

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**1.2.8	40.6	34.3	34.4	35.6	39.7	38.7	47.3	43.6	46.5	49.1	46.8	0.0	456.6
OG9121968 Participant Technical Project Office	27.1	29.1	29.7	25.2	24.4	22.6	15.8	34.4	23.4	44.6	48.1	0.0	324.4
1.2.9.1.2.1	27.1	29.1	29.7	25.2	24.4	22.6	15.8	34.4	23.4	44.6	48.1	0.0	324.4
*1.2.9.1	27.1	29.1	29.7	25.2	24.4	22.6	15.8	34.4	23.4	44.6	48.1	0.0	324.4
OG922968 Participant Project Control - USGS	19.9	20.9	19.7	20.5	27.0	18.8	18.1	22.0	17.9	44.3	29.5	0.0	258.6
1.2.9.2.2	19.9	20.9	19.7	20.5	27.0	18.8	18.1	22.0	17.9	44.3	29.5	0.0	258.6
*1.2.9.2	19.9	20.9	19.7	20.5	27.0	18.8	18.1	22.0	17.9	44.3	29.5	0.0	258.6
**1.2.9	47.0	50.0	49.4	45.7	51.4	41.4	33.9	56.4	41.3	88.9	77.6	0.0	583.0
OGC52196B Records Operation (USGS)	5.4	3.5	3.3	4.8	4.9	6.7	15.3	8.8	8.0	2.3	3.8	0.0	66.8
1.2.12.5.2.1	5.4	3.5	3.3	4.8	4.9	6.7	15.3	8.8	8.0	2.3	3.8	0.0	66.8
*1.2.12.5	5.4	3.5	3.3	4.8	4.9	6.7	15.3	8.8	8.0	2.3	3.8	0.0	66.8
**1.2.12	5.4	3.5	3.3	4.8	4.9	6.7	15.3	8.8	8.0	2.3	3.8	0.0	66.8
OGF2396B1 Support/Personnel Services	49.0	42.6	37.2	41.8	39.7	52.0	43.6	29.5	38.0	30.0	34.3	0.0	437.7
OGF2396B2 Facilities Management - Space	85.4	57.6	71.0	71.3	71.3	71.3	71.3	71.3	71.3	71.3	71.3	0.0	784.4
OGF2396B3 Facilities Management - Computers/Phones	24.9	17.1	20.4	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	0.0	228.8
OGF2396B4 Facilities Management - Other	13.3	8.7	11.2	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	0.0	122.0
OGF2396B5 Procurement/Property Management - USGS	2.2	12.4	7.9	8.6	7.8	8.5	8.8	9.8	7.9	7.8	3.8	0.0	85.5
1.2.15.2.3	174.8	138.4	147.7	153.6	150.7	163.7	155.6	142.5	149.1	141.0	141.3	0.0	1658.4
*1.2.15.2	174.8	138.4	147.7	153.6	150.7	163.7	155.6	142.5	149.1	141.0	141.3	0.0	1658.4
OGF396B YMP Support For The Training Mission (US	5.6	5.0	4.0	3.6	7.7	4.3	14.2	15.1	15.4	5.9	7.4	0.0	88.2
1.2.15.3	5.6	5.0	4.0	3.6	7.7	4.3	14.2	15.1	15.4	5.9	7.4	0.0	88.2
*1.2.15.3	5.6	5.0	4.0	3.6	7.7	4.3	14.2	15.1	15.4	5.9	7.4	0.0	88.2
**1.2.15	180.4	143.4	151.7	157.2	158.4	168.0	169.8	157.6	164.5	146.9	148.7	0.0	1746.6
1.2 OPERATING	1018.8	1050.0	1093.3	1267.5	1440.2	1224.7	1239.0	1502.7	1332.8	1441.9	1530.1	0.0	14141
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	16..
GRAND TOTAL	1018.8	1050.0	1093.3	1267.5	1440.2	1224.7	1255.0	1502.7	1332.8	1441.9	1530.1	0.0	14157.0
FTEs													
FEDERAL	118.1	125.4	123.4	133.7	118.8	121.9	112.7	127.9	121.1	129.6	129.7	0.0	
CONTRACT	7.9	8.6	11.1	15.4	17.4	21.5	22.7	28.0	27.1	26.9	24.3	0.0	
TOTAL	126.0	134.0	134.5	149.1	136.2	143.4	135.4	155.9	148.2	156.5	154.0	0.0	

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