



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

QA: N/A

APR 26 1999

**OVERNIGHT MAIL**

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High Level Waste & Uranium Recovery  
Division of Waste Management  
Office of Nuclear Material Safety & Safeguards  
U.S. Nuclear Regulatory Commission  
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Rockville, MD 20852

**SUBMITTAL OF PARTICIPANT'S MONTHLY PROGRESS REPORT**

As you have requested, the U.S. Nuclear Regulatory Commission is on distribution to receive a copy of the Yucca Mountain Site Characterization Project participant's monthly status report on a regular basis. Enclosed is the U.S. Geological Survey Progress Report for March 1999.

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

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

OL&RC:BMT-1212

Enclosure:  
Ltr, 4/14/99, Craig to Kozai, w/encl.

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## INFORMATION ONLY

April 14, 1999

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

**SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)  
Progress Report, March 1999**

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

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

Sincerely,

*Raye Ritchey Arnold*  
for Robert W. Craig  
Technical Project Officer  
Yucca Mountain Project Branch  
U.S. Geological Survey

**Enclosure:**

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D. Williams, DOE, Las Vegas  
C. Glenn, NRC, Las Vegas (2 copies)  
R. Wallace, USGS, Reston  
K. Ashe, M&O/Duke, Las Vegas  
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# U.S. GEOLOGICAL SURVEY EXECUTIVE SUMMARY

March 1999

## COORDINATION and PLANNING

The U.S. Geological Survey-Yucca Mountain Project Branch continued processing of some 58 documents prepared by USGS authors. Of these listed items, 36 are USGS reports (19 concerning geological topics and 17 concerning hydrologic topics), 14 are journal articles (eight are geologic in topic and six are hydrologic), and three are abstracts for which records packages are in process. Five milestone reports also are being processed. During March, one publication package (WRIR 98-4050) was sent to the Records Coordinator for transmittal to the Records Processing Center. One water-resources investigation report was published:

D'Agnese, F.A., O'Brien, G.M., Faunt, C.C., and San Juan, C.A., 1999, Simulated effects of climate change on the Death Valley regional ground-water flow system, Nevada and California: U.S. Geological Survey Water-Resources Investigations Report 98-4041, 40 p.

## GEOLOGY

The mapping team continued efforts toward completing full-periphery maps and detailed line-survey technical reviews. The staff also continued work on the report *Geology of the ECRB Cross Drift, Stations 0+00 to 26+81*. The report is essentially complete but cannot be developed further until Q field-survey data are available. All reviews of data packages are essentially complete, but those also cannot be submitted until the survey data are available. Submittal of geotechnical data from the Cross-Drift project is likewise awaiting submittal of Q survey data.

In unscheduled work, staff attended and made presentations in Las Vegas at the Appendix 7 meetings with the NRC. In additional unscheduled work, staff arranged meetings with C. Rautman (SNL), J. Pye, R. Dow, and M. Mrugala (MK/M&O), D. Sweetkind, M. Fahy, and D. Hudson (USGS), J. Hinds (LBNL), and R. Lung (USBR). The group visited the ECRB Cross Drift and picked locations for the upcoming small-scale fracture study. Staff from the mapping team accompanied a group from Brigham Young University on an all-day visit to the ESF and Yucca Mountain. Other staff re-drew cross-sections from the ESF for inclusion in the site-description report.

Stratigraphic efforts continued during the period with on-going development of (spreadsheet) workbooks for each borehole used in the geologic framework modeling (GFM) effort that is currently in review.

## HYDROLOGY

### Unsaturated-Zone Hydrology

Air-permeability work continued with efforts on the Ghost Dance fault experiments. The North Ghost Dance fault (NGDF) data package has completed technical and initial QA reviews, and all reviewers' comments have been incorporated. The NGDF report also has completed technical review; related reviewers' comments have been incorporated. Additional QA review to AP-3.10Q requirements is underway.

Several efforts continued in modeling of infiltration. In work on the infiltration model, development of the users' manual for the modified INFIL code continued. Work also continued on finalizing model test cases to satisfy software QA for modification of routines. Organizing and compiling all input/output files, model codes, and test applications onto CD-ROMs continued. A set of analog sites with sufficient daily climate records for use in model simulations was selected for defining potential future-climate scenarios for the next 10,000 years. Data from two sites (Hobbs, New Mexico, and Nogales, Arizona) are being used to define the upper-bound (wettest potential climate) monsoon future-climate scenario, predicted to occur at 600 years from present day and to last for 1400 years. The modern-day climate is being used as the lower bound (driest potential climate) for this same period. Data from three sites (Spokane, Rosalia, and Saint John, Washington) are being used to define the upper-bound glacial transition, and two sites (Beowave, Nevada, and Delta, Utah) are being used to define the lower-bound glacial transition. The glacial-transition climate is predicted to occur 2000 years from now and to last for 10,000 years. Daily climate data (precipitation and air temperature) were extracted from the Earth-Info (NCDC) data base for all selected analog sites, and the records were compiled and re-formatted into model-input files. The new modern-day climate simulation (with upper- and lower-bound estimates) has been finalized and represents the lower-bound monsoon climate. For the upper-bound monsoon climate, simulations were completed for the 10 watershed-model domains for the site-scale model for each analog site and averaged to produce the upper-bound monsoon-climate result. For the glacial-transition climate, the five sets of 10 simulations are in progress. Those simulations use a modified version of the infiltration model which includes a preliminary snow-cover module. Calibration continued of the new net-infiltration model (which uses a layered root-zone system and a coupled net-infiltration/surface-water flow-routing algorithm), using available stream-flow records. Work also continued on an integrated model calibration using a combination of data sets including measured water-content profiles. Development of a snow-cover module was completed. Work on analysis of model uncertainty and interpretation of model results began. Parameter distributions were estimated for nine model-input parameters. The defined distributions were applied using the LHS method to establish the set of simulations that will be performed to quantify model uncertainty and to identify sensitive parameters. Work on defining distributions for remaining parameters that will be used in this analysis continued.

In moisture monitoring in the Cross Drift, temperature, relative humidity, and wind-speed data were collected from monitoring stations at Cross Drift Stations 0+25, 2+37, 2+88,

3+38, 10+03, 21+07, and 24+75. Temperature and relative humidity data were collected from the vent line at Cross Drift Station 0+00. Water potential in the Cross Drift was monitored with the 100 heat-dissipation (HD) probes installed in 2-m-deep drill holes spaced at 25-m intervals from Cross Drift Station 0+50 to Station 25+25. Those measured water potentials continued to indicate that the rock mass is wetter (that is, the potentials are higher) and that the moisture is more uniformly distributed than expected. Water-content profiles were measured on April 1 with a neutron probe in ten 2-m-deep boreholes and in one 6-m-deep borehole in the region from Cross Drift Station 20+00 to Station 25+00.

Support to engineered-barrier system (EBS) tests continued. Hydrologic data were collected for Canister #1 in the quarter-scale pilot test. (That Canister #1 test is the Richards' Barrier Test with Overton Sand over 8-20 sand.) Water-potential data were collected with eight HD probes, water-content data with three time-domain reflectometry probes, and effluent data were collected using suction lysimeters in coarse and fine sand layers. The Canister #2 quarter-scale test (backfill test with 8-20 sand) was completed, using 16 HD probes to collect water-potential data. The test was disassembled, and samples for water content were collected on March 2. Water content was measured using oven drying. Planning and procurement began for the Canister #3 quarter-scale test. That experiment will test the drip shield and 4-20 quartz sand. Staff attended planning meetings in Las Vegas (March 18) and Albuquerque (March 26) for the Canister #3 test.

Staff attended planning meetings and a field trip into the ESF on March 9 to select sites for small-scale fracture mapping. Planning also began for FY2000 work to measure saturated and unsaturated permeabilities at the planned small-scale fracture-mapping transects. Six mapping transect locations were chosen, including Cross Drift Station 11+15 to 11+21 (Ttpmn); Cross Drift Station 13+00 to 13+06 (Ttpmn); Cross Drift Station 15+25 to 15+31 (Ttppl); Cross Drift Station 17+35 to 17+41 (Ttppl); Cross Drift Station 22+15 to 22+21 (Ttppl); and Cross Drift Station 24+25 to 24+31 (Ttppln). Tempe Cell water-retention data for four replications of 8-20 sand and two replications of Overton Sand were completed. Software-qualification efforts began for the RETC program.

Efforts in characterization of seepage into alcoves continued. Monitoring of temperature, relative humidity, and barometric pressure continued in the ESF Main Drift and niches and in Alcove #7. Data were collected from 51 HD probes in Alcove #7. Eight surface-based HD probes monitored soil moisture potential in and adjacent to the Ghost Dance fault. Dust samples were collected in the Ghost Dance fault alcove. Twenty-one HD probes monitored the rock water potential in Niche #1. Temperature and relative humidity probes (which were soon to pass calibration due dates) were replaced at each location. Planning for the cross-drift characterization experiment has begun. Plans are being developed for instrumentation placement and the location and number of boreholes needed. An initial draft of that plan has been submitted to the Test Coordination Office. Preliminary designs of the water-supply system and tracer-injection system currently are being tested. In tracer/infiltration experiments, water applications were resumed at Alcove #1 on February 19. All of the water-collection system in the alcove has been

installed and tested. To date, 13,000 gallons of water have been applied to the surface above Alcove #1. Seepage into the alcove began on March 6. To date, approximately 500 gallons of water have been collected in the alcove. All instrumentation has been checked and is working correctly.

Investigation of hydraulic properties at Busted Butte continued. Measurement of physical properties and saturated hydraulic conductivity on 12 samples was completed. Data were submitted to the TDB on March 26. About 50 samples have been cored and prepared for testing.

Drift-scale testing (DST) work continued with chemical and isotopic analyses. Water samples collected in November and January have now been received and are being analyzed for U and Sr isotopes. Staff participated in sample collection from the DST block on March 30. Samples collected from borehole 60-3 on that date also have been submitted for isotopic analysis. Results of U and Sr isotope analyses are expected in April.

Various efforts continued in UZ hydrochemistry. P. Glynn (USGS) continued work on the draft report on geochemical modeling to correct perched-water  $^{14}\text{C}$  ages at Yucca Mountain. Various extractions were performed on numerous samples. Two USW WT-24, four USW SD-6, and thirteen Nye County water samples were analyzed for anion, silica, and alkalinity concentrations, and four WT-24, eight SD-6, and thirteen Nye County water samples were analyzed for cation concentrations. Pore water was extracted from four WT-24 core samples using one-dimensional compression. That extracted water, all from one core segment, will be combined and sent to Beta Analytic for carbon-isotope analysis. Nine SD-6 and seven WT-24 pore-water samples were prepared for tritium counting (and counted), tritium activities were calculated, and the data were reduced. Pore water was extracted by centrifuge methods from one SD-6 and six WT-24 core samples. The extracted water will be analyzed for major-ion chemistry,  $^{18}\text{O}/^{16}\text{O}$ , and D/H stable isotope analysis. Pore water also was extracted by centrifuge methods from two USW SD-9 core samples to compare different types of sample-preparation methods. The extracted water will be analyzed for uranium,  $^{18}\text{O}/^{16}\text{O}$ , and D/H isotope ratios. Pore water was extracted from seven SD-6 and nine WT-24 core samples by vacuum distillation. The extracted pore water will be analyzed for tritium and/or  $^{18}\text{O}/^{16}\text{O}$  and D/H isotopic analysis. Pore water was distilled, and dissolved  $\text{CO}_2$  was extracted, from five ESF core samples. The  $\text{CO}_2$  will be analyzed for carbon isotopes, and the pore water will be analyzed for tritium. Calcite removed from a WT-24 core sample was acidified under vacuum, and the evolved  $\text{CO}_2$  was collected in a glass trap. The  $\text{CO}_2$  gas will be sent to Beta Analytic for carbon isotope analysis. Results of analysis of water samples collected by centrifuge, compression, and distillation methods during March were recorded in the water-collection data base. Results of tritium analysis were recorded in the tritium data base, and anion, cation, silica-concentration, and alkalinity results were recorded in the major-ion data base. Data packages were prepared for (1) elemental compositions of rock core samples from SD-9 and SD-12 obtained with X-ray fluorescence, and (2) strontium isotopic ratios and Sr concentrations in rock core samples and leachates from SD-9 and SD-12. Both packages were completed on March 29.



In unscheduled work, staff attended the UZ model workshop at LBNL on March 15 and 16 and presented the latest new tritium-concentration data (from pore water taken from SD-9 and WT-24 cores) and the estimated UZ percolation flux (calculated from moisture contents and  $^{14}\text{C}$  values from several boreholes). A conceptual model of UZ flow based on those data also was presented. Several data and QA issues also were resolved, and evaluation of tritium detection limits for in-house analyses continued.

#### Saturated-Zone Hydrology

Water-level measurements were made at several sites, including UE-25 WT#6, UE-25 WT#16, UE-25 WT#15, and UE-25 p#1 on March 3; USW WT-2, USW H-4 (upper and lower intervals), UE-25 WT#4, and UE-25 WT#13 on March 5; USW H-3 (upper and lower intervals) on March 8; USW H-6 (upper and lower intervals), USW WT-7, USW WT-10, and USW VH-1 on March 9; UE-25 J-11 on March 10; USW H-1 (tubes 1, 2, 3, and 4), USW G-2, and USW WT-1 on March 11; USW H-5 (upper and lower intervals), UE-25 J-12, and UE-25 J-13 on March 15; USW WT-2 on March 17; UE-25 WT#3 and UE-25 WT#17 on March 18; and USW WT-24 on March 24. A calibration check of Paroscientific transducer (s/n 65610) was performed, and the instrument was placed into borehole USW WT-2 on March 17. Setra barometer (s/n 971434) likewise was installed at borehole USW WT-2, also on March 17. Water-level measurements collected for March were compiled, and water-level work sheets were completed. Review of the data package for the second quarter FY1999 data began.

In saturated-zone testing, through March 30, the total drilled depth of borehole USW SD-6 remained at about 2,541 feet below land surface. The construction crew has grouted the whipstock and has tripped in 9-5/8 inch casing to 2,275 feet. An external packer will be used to secure the temporary casing (used to prevent return fluids from entering the saturated zone when the borehole is completed to depth). Borehole USW WT-2 was instrumented with a transducer on March 17 and will be used as an observation well during the testing of USW SD-6. Locations for the discharge line and tank were spotted on March 30. The final discharge point will be south of borehole UZ-6. The Field Work Package for USW SD-6 drilling and testing was reviewed on March 12. Comments were addressed and included in the final Field Work Package.

Many elements of the modeling of the Death Valley regional flow system (DVRFS) continued. Entry of spring-discharge measurements from published reports continued, as did compilation of regional data. Preliminary hydrochemistry data were reviewed in attempts to identify incorporation problems with the DVRFS data base, requiring modifications to that database structure. NWIS data (including recently available water-table measurements) were retrieved for use in populating the DVRFS data base. Updates from NWIS have now been automated. The memorandum to satisfy Level 4 milestone SPH701M4 [Memo to TPO: Progress in acquisition and merging of data to DVRFS data base] was completed on March 31. For the steady-state model, work continued on ACCESS forms to facilitate MODFLOW2000 processing, and work also continued on modifications to the ARCVIEW interface to enhance efficiency of transitions

to new database versions. Other MODFLOW2000 work involved improvement of the handling of vertical conductances and modifications to input instructions for the flow-process modeling. Work on parallelizing MODFLOW2000 continued, with efforts to correct parameter estimations. Second-iteration sensitivities computed with multiple processors required corrections, some of which have been completed. Hydrographs of all water-level sites within the Yucca Mountain site-scale model boundary and sites on Pahute Mesa were created, and acceptable-quality historical data were annotated. A memorandum for Level 4 milestone SPH707M4 [Memo to TPO: Progress report: merging spatial GIS data] was completed, also on March 31. Revisions to procedure GP-01 ("Geologic Mapping") continued, in part to cover mapping of surficial units with use of processed satellite-image maps. Revisions were made, and an abstract titled *Development of a relational hydrogeologic data base and data-analysis tool for the Death Valley regional flow system model* received USGS Director's approval for the Proceedings of the "Geologic Research and Mapping in Death Valley" workshop.

Work on the Death Valley regional geologic map continued with planning tasks and with editing of papers for the Proceedings volume noted above. Work on generalization of the Las Vegas 1:100,000-scale map to 1:250,000 was completed. Edge matching to adjacent mapped area began. The correlation chart of map units was updated. Preparations for acquisition of some 21 Landsat image maps (processed for enhancement of surficial geology at 1:100,000 scale for direct mapping and compilation) continued. Tests of appropriate methods to print topography, road networks, and similar features on overlays to these images also continued. High-altitude photography (1:80,000-scale) was reprocessed to enhance usefulness in support of the satellite images. Integration of bibliographies of geologic work in the DVRFS area continued. Simplified depiction of surficial units from the 1:100,000-scale Las Vegas sheet was tested successfully to evaluate amount of detail possible at 1:250,000. A multi-day reconnaissance field trip was used to test the preliminary surficial-deposit units for the regional map, and in another trip, mapping of surficial units was conducted, including a test of recently acquired global-positioning equipment. Additional photointerpretive mapping and digital compilation was completed in the Skull Mountain and Skeleton Hills NW quads on the Beatty 1:100,000-scale sheet.

Several elements of the evaluation of geological control of regional flow continued, including evaluation of sequence-stratigraphy relations for Paleozoic rocks. The first version of the tectonic map and a 1:250,000-scale gravity map (including maxima on gravity gradients for determination of location of faults) were issued. Caldera outlines and locations of some buried faults in the southwestern Nevada volcanic field were revised. Cross sections in the Oasis Valley area also were revised using newly available depth-to-basement data. Additional geologic mapping was conducted along the western boundary of the Amargosa Desert, and NWIS data were adapted for use in compilation of Amargosa Desert borehole data. Correlations of subsurface data are underway, to be compiled in an ACCESS data base. Planning continued for a conference in Denver to discuss data needs of proposed detailed studies in the DVRFS model area, with focus on discharge zones. The hydrogeologic framework model (HFM) was enhanced with a smoothed potentiometric surface to constrain tops of flow layers and thence to produce

input files for the flow model. The HFM was reconstructed at 1500-m grid spacing for compatibility with node spacing of the flow model.

In work on the conceptual flow model, a FORTRAN program to compile daily climate data (consisting of precipitation, air temperature, and snow-depth data) was developed to use data from the last 100 years in improved input files for regional recharge modeling. Work continued on compilation of regional soils data and utilization of stream-flow records. Hydrochemical data from UGTA were reformatted for combination with existing data, and flow-path evaluations continued. A discharge map for all nodes to be used for regional discharge was developed. Work also continued on development of model-calibration processing routines.

### CLIMATE and PALEOHYDROLOGY

Fluid-inclusion studies continued. Samples of UZ mineral coatings containing calcite were submitted for preparation of (thin) sections suitable for petrographic and fluid-inclusion observations. Fluid-inclusion sections were sent to Harvard University for examination and description; examination of petrographic sections proceeded in Denver. Samples were shipped with two different types of temperature loggers in heavily insulated containers; the resulting logs indicated that the insulation apparently protected the samples from temperature extremes. Plans were finalized for a meeting in Las Vegas to structure the joint sampling/parallel investigation of ESF calcite-hosted fluid inclusions with UNLV and the State of Nevada. That meeting will take place during the week of April 19. In unscheduled work, an abstract titled *Paragenesis and oxygen isotopes of calcite in the unsaturated zone of Yucca Mountain, Nevada: Evidence of an early thermal event*, by J.F. Whelan, J.B. Paces, R.J. Moscati, L.A. Neymark, B.D. Marshall, and Z.E. Peterman, was prepared and accepted for the 1999 Spring meeting of the American Geophysical Union.

Staff continued work on preparation of the report (initiated in February) describing the basis of future-climate prediction. Current work involved comparison of precession and eccentricity parameters with the Devils Hole (DH)  $\delta^{18}\text{O}$  record to evaluate the basis for establishing the timing of climate change from orbital parameters. Work suggested that changes in the DH record can be predicted from precession and eccentricity data for the past 450,000 years, and hence a basis exists to establish the timing of climate change for the next 10,000 years. The latter relation is one of two key issues the report must cover for TSPA/LA. In work on refining the Climate Tables, a literature search continued for references dealing with future climate. Staff also continued attempts to refine the chronology of the Owens Lake record for the interval being used to forecast climate for the next 10,000 years. Establishing a defensible basis for the forecasted future-climate states is a fundamental component of the refinement of the Climate Tables.

### SPECIAL STUDIES

USGS input to Site Characterization Progress Report #20 was compiled and submitted to NEPO technical leads for their consideration. Input was compiled from USGS monthly status reports submitted to YMSCO for October 1998 through February 1999. In a few cases, additional information was obtained directly from USGS PIs or from Level 4 milestone reports submitted in September 1998. Narratives of progress for the period October 1998 through March 1999 were prepared for the following topics:

- Geology of the ECRB Cross Drift.
- Geologic map for the saturated-zone flow and transport modeling area.
- Descriptions of various fault zones in the vicinity of the central block of Yucca Mountain.
- Publication of a report on numerical simulation of air- and water-flow experiments in a block of variably saturated, fractured tuff from Yucca Mountain.
- Uranium isotopic data from pore water extracted from the nonwelded PTn in the ESF.
- Relations between chlorine-36 and fracture-mineral sample sites.
- Fluid-inclusion studies of calcite mineral deposits.
- Second infiltration test in the ESF Upper Tiva Canyon Alcove.
- Completion of draft report on ESF Northern Ghost Dance Fault (NGDF) alcove testing.
- Publication of a report on the hydrogeology of the unsaturated zone in the vicinity of the ESF North Ramp.
- Moisture monitoring in the ESF ECRB Cross Drift.
- ESF moisture-balance study of construction water.
- Collection of rock samples from the ESF ECRB Cross Drift for chlorine-36 analysis.
- Updated net-infiltration model.
- Changes in monitoring of deep unsaturated-zone boreholes.
- C-holes hydraulic, conservative-tracer, and reactive-tracer testing in the Prow Pass Tuff.
- Plans for continuation of drilling of borehole SD-6 to the water table.
- Nye County Early Warning Drilling Program.
- Comprehensive regional saturated-zone flow model for the Death Valley system.
- Water-level measurements in Devils Hole and decline there in the pupfish population.

As a part of the PR #20 compilation, references cited in past semiannual progress reports (PRs #17, #18, and #19) were evaluated to determine if their publication (or non-publication) status had changed. Particular attention was given to "in preparation" references (PR #17 only) and Level 4 milestone reports where there was some expectation that the report or its content would be published in the future. Updated reference information was provided for 16 such USGS references.

## **WATER-RESOURCES MONITORING**

Ground-water levels were measured at 29 sites, and ground-water discharge was measured at one flowing well. Ground-water data collected during February 1999 were

checked and filed. USGS-Environmental Monitoring Program (EMP) personnel stopped making water-level measurements at seven sites (CF-2, JF-1, JF-2, JF-2a, J-11, J-12, and J-13) as USGS-ESIP personnel resumed monthly data collection at those sites. In environmental program support, staff met with USGS-YMPB QA staff to complete all quality-assurance criteria related to the technical review of the data package for the monitoring report for calendar year (CY) 1997. The summary monitoring report for CY 1997 was forwarded to DOE on March 18 by USGS-YMPB for review and concurrence. The Nevada District Reports Section continued preparation of camera-ready copy of the report. Staff also participated on March 16 in the Nevada District's project review of the ground-water monitoring activity. In work on preparation of the summary monitoring report through calendar year 1998, compilation continued for technical and USGS-YMPB QA/policy reviews of the data package for the summary monitoring report for CY 1998. Revision began (based on determination of final correction factors) of water-level measurements made with electric tapes in CY 1998. Processing and evaluation of pressure-sensor data collected at wells JF-3 and AD-6 during CY 1998 continued. Staff began compilation of data on ground-water withdrawals.

In work with the tipping-bucket rain-gage network, all data were downloaded from the 17 tipping-bucket gages during the week of March 1. All stations were in good operating order. All data are being reviewed and assembled into electronic data records.

# USGS Level 3 Milestone Report

October 1, 1998 - March 31, 1999

Sorted by Baseline Date

<u>Deliverable</u>	<u>Due Date</u>	<u>Expected Date</u>	<u>Completed Date</u>	<u>Comments</u>
Letter Report: 4th Qtr FY98 Milestone Number: SSH14HM3	10/30/98	10/29/98	10/29/98	
Letter Report: 1st Qtr FY99 Milestone Number: SSH14IM3	1/29/99	1/28/99	1/28/99	
Preliminary Geologic Map for SZ Site Area Milestone Number: SPG258M3	3/5/99	4/30/99		
Submit UZ-7a & UZ-14 Rpt for Director's Approval Milestone Number: SPG630M3	3/15/99	6/15/99		
Ghost Dance Fault Data Pkg and Testing Report Milestone Number: SP3515M3	3/30/99	4/30/99		
Geo/Geotech Data fin X-Block Drift Project Milestone Number: SPG42GM3	3/31/99	8/16/99		

# USGS Level 4 Milestone Report

October 1, 1998 – March 31, 1999

Sorted by Baseline Date

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