United States Department of the Interior

U. S. GEOLOGICAL SURVEY
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IN REPLY REFER TO:

INFORMATION ONLY

July 11, 2003

Victor W. Trebules
Director, Office of Project Control
Office of Civilian Radioactive Waste Management
Office of Repository Development
P.O. Box 364629
North Las Vegas, Nevada 89036-8629

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS) Progress Report, June, 2003

Attached is the USGS progress report in the required format for the month of June, 2003.

If you have any questions or need further information, please call Raye Ritchey Arnold at (303)236-5050, ext 296.

Sincerely,

Raye Ritchey Arnold

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

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U.S. GEOLOGICAL SURVEY
Executive Summary
YUCCA MOUNTAIN PROJECT BRANCH

June 2003

Presentations at the recent High-Level Radioactive Waste Management (HLRWM) conference reported results of an array of YMPB investigations by USGS and related staff, including work in isotope geochemistry and validation of "bomb-pulse" chlorine results. Summaries of that work will appear in these USGS monthly narrative reports, arranged with related subject matter, and with titles, author(s), and pagination of publication, to expand distribution of those papers beyond the tighter focus of the HLRWM conference. Details of the full reference citations for the papers are as follows:

> [Author(s)], 2003, [title], *in* High-Level Radioactive Waste Management, Proceedings of the Tenth International Conference, Las Vegas, Nevada, March 30—April 2, 2003: La Grange Park, Illinois, American Nuclear Society, [pages].

GEOLOGICAL STUDIES

Borehole lithostratigraphy interpreted by USGS staff from Nye County drilling remained a focus of geologic effort. Processing of bit-cutting samples from Nye County early-warning drilling program (EWDP) boreholes NC-EWDP-16P, -27P, and –28P was completed by the Sample Management Facility (SMF), and USGS staff described bit-cutting samples and thin sections and conducted analysis of trace-element characteristics. The current data base contains information on only very few samples of young local volcanic units such as the Ammonia Tanks Tuff, the Rainier Tuff, and the Wahmonie Formation. Surface samples of those units were collected to augment the trace-element data base used to support the technical basis for lithostratigraphic identification and interpretation.

Preparation for publication of the completed geologic map of the potential southern repository-expansion area continued during June. The map has returned from review by the USGS Central Region Publications Group. Editorial and formatting changes were needed, and that revision is in process, with anticipated July completion. The revised map will be resubmitted to Central Region for USGS Director's approval. Once that approval is obtained, submittal to the TDMS/RPC will be initiated.

Geologic staff of the USGS and the Bureau of Reclamation provided important feeds to design and construction groups (BSC). Several issues raised after the Nuclear Regulatory Commission RDTME (Repository Design and Thermal-Mechanical Effects) technical exchange prompted scrutiny of fracture-mapping methods, analysis, and results. Those questions were formalized in an AP-2.14 technical review and have now been answered.

In-depth statistical comparisons of observed and synthetic fracture data, including length and spacing of fractures, resulted in completion of final concurrence. A related scientific notebook (SN-USGS-SCI-084-V1) has been reviewed and is expected to be submitted to the RPC by late August.

As requested by BSC design and construction groups, USGS and Bureau of Reclamation provided estimates and scope of work for beginning a Material Borrow Program for surface construction facilities at the ESF North Portal. A four-phase program was proposed, and scope and estimate were completed for the first two phases. Phase 1 would consist of 12 to 15 test pits on the North Portal pad and muck pile to characterize existing material. Samples collected from those test pits would be laboratory-tested for gradations in fragment size, Atterberg limits, and specific gravity. Phase 2 would consist of compilation of existing field mapping and research, culminating in excavation of 15 to 20 test pits aimed at delineation of potential borrow areas. Samples from those additional pits likewise would be laboratory-tested for gradations, Atterberg Limits, and specific gravity. The goal of the program would be to provide the Project with ability to develop design data required for construction-subcontract specifications. Additional Phases 3 and 4 are design-data investigations for specification of borrow material, concrete aggregate, and rail and road alignments.

In mechanical-property testing work, a data package entitled "Direct shear data from selected samples of the Topopah Spring Tuff" (DTN: GS030283114222.001) was submitted to the TDMS to complete **milestone PAGSW530M4 [Rock Mechanics (Direct Shear) Data to TDMS/RPC]** on June 13. Additional laboratory rock testing (the Creep Test) continued. A decision from BSC as to date of conclusion of that testing is pending.,

Activity in characterization of the repository host horizon (RHH) included sampling for thin-section analysis and photography of several approximately 14-m^2 areas on the left rib using low-angle illumination techniques and composite images. Resultant digital images span areas which can be used for small-scale fracture traverses, and subsets can be used for 1-m by 3-m panel maps. Additional areas on the right rib were photographed for comparison with the left rib. Panel mapping remained an ongoing effort. Six angular traverses have been completed, four in the upper lithophysal zone and two in the middle nonlithophysal zone. Data collection for three small-scale fracture traverses is completed (one traverse in the lower part of the lower lithophysal zone and two traverses in the upper lithophysal zone).

Excel-based data-collection workbooks have been designed for linear traverses along boreholes to determine the abundance of lithophysal cavities in RHH-equivalent rock units. Collection of data from one borehole has been completed. Those data are being summarized, but initial results indicate trends in the abundance and location of lithophysae consistent with results determined by other techniques.

Comment resolution from technical reviews of the Deterministic Seismic Hazards Analysis continued, with necessary revisions to that report taking longer than anticipated

due to competing mapping schedules in Death Valley. There is no impact on other work because of the delay, and completed revisions are expected shortly.

SATURATED-ZONE STUDIES

Activity in borehole monitoring continued. As part of barometric data compilation, a data-summary sheet was developed for Alluvial Test Complex (ATC) milestone PAGSM434M5 [ATC Barometric Monitoring Data to Data Management Unit], and a related Excel spreadsheet is approximately 60% complete. Preparation of data packages began late in May for background water-pressure and barometric variations during the monitoring period, along with transducer and data-logger calibrations. Close-out of ATC work was delayed slightly due to necessary precedence of response to technical comments on the SZ *in situ* testing AMR.

Determination of suitability of analytical lab results is ongoing and impacts the use of carbon isotope (^{14}C) data in SZ flow interpretations. (Problems with laboratory analysis of standard samples have not been fully resolved, so analyses likewise cannot be fully utilized.) As another result, inclusion of those sample data into the hydrochemical data base awaits verification of the laboratory.

Work on the Death Valley regional flow system (DVRFS) continued efforts in compilation of available data and construction of databases to support modeling; in adjustments, enhancements and improvements of the hydrogeological framework for model construction; and in actual modeling. Maintenance and integration of hydrogeologic data remained a focus. Work continued on maintenance of the project web site to serve knowledge-exchange and modeling-team meetings. Three-dimensional hydrogeologic framework model (HFM) construction and review continued, with focus on examination of thickness distributions and correction of inconsistencies. Status of that work was reported in **milestone PAGSM32BM5 [Progress Report HFM Updates—Transient model]**, completed on May 30.

Work also continued on flow-model calibration. Major changes this month included updates to water-table elevations to reflect the current model. Constant-head boundary cells were redefined using an updated potentiometric contour map. Some of the locations of the constant-head boundary cells were altered, and as a result, some hydraulic conductivities along boundaries were adjusted to represent more accurately boundary fluxes. That enhancement led to better matching with hydraulic-head observations and boundary fluxes. Additional effort was focused on representing hydrologic properties of basin-fill units. A memorandum reporting completion of the flow-model chapter of the DVRFS transient-flow model report was prepared and submitted in completion of **milestone PAGSM34DM5 [Report Contribution to Report Editor]** on June 30.

Enhancement of model details continued, with the greatest effort focused on matching hydrographs in pumping areas. For example, in Pahrump there is now a difference in simulated water-level elevation between model layers. The starting head at initiation of

the transient simulation is closer to observed values, as is the amount of simulated drawdown. For some hydrogeologic units located in pumping centers, modeled hydraulic conductivity was adjusted to diminish with depth. That modification allows a sufficiently steep cone of depression at wells but still permits flow out the aquifer at discharge areas.

Knowledge exchange remained an important focus of DVRFS effort. Ongoing work continued on several chapters for the transient-flow model report, including the flow-model chapter. **Milestone PAGSM37LM5 [Meeting Summary to the TPO for the May Knowledge Exchange Meeting]** was completed on June 6 (delayed by the late-month scheduling of that meeting), and similar **milestone PAGSM37MM5 [Meeting Summary to the TPO for the June Knowledge Exchange Meeting]** was completed on June 30.

UNSATURATED-ZONE STUDIES

The infiltration experiment in Alcove #8/Niche #3 continued. **Milestone PAGSW26M4 [Plot Infiltration/Tracer Experiment Data Package – TDMS/RPC]** was completed on June 30. That comprehensive data-package submittal consisted of five parts, including "Surface Infiltration in a Large Plot in Alcove 8 Using Permeameters from August 20, 2002 to November 19, 2002;" "Photographs from Niche 3 of the Alcove 8/Niche 3 Seepage Experiment During Construction Showing Construction Water in Niche 3, March 6, 2000;" "Surface Infiltration in a Large Plot in Alcove 8 Using Permeameters from November 19, 2002 to March 24, 2003;" "Physical Properties of Borehole Samples from Niche 3 of the ESF: Measurements from 7/05/00 to 7/13/00;" and "Physical Properties of Borehole Samples from Alcove 8 of the ECRB: Measurements from 7/10/00 to 7/19/00."

Relocation of staging and work areas from the Hydrologic Research Facility and Site Maintenance Building to smaller buildings in the Central Support Area is currently underway.

On May 20, USGS scientists entered the sealed bulkheads in Alcove #7 (the southern Ghost Dance fault alcove). Behind the first bulkhead (at 64 m) the alcove floor and walls were dry, and wall-mounted cables and pipes were coated with a dry layer of dust. At 80 m, moisture was observed on cables. In the area at 100 m to 134 m, the walls and floor remained dry, but the alcove crown was wet. Earlier monitoring had shown that relative humidity did not exceed 95%, and the water on the crown therefore was not due to condensation but likely was seepage. Behind the second bulkhead (at 134 m), moisture content was even greater. The entire crown was wet, and moisture extended partially down the alcove walls. Moisture drip sheets located at 169 m and 181 m showed limited (color change in the sheet) signs of liquid water. All indications are that the water identified at the crown of Alcove 7 is seepage. During June, the monitoring instruments in Alcove #7 were replaced and reset for continued monitoring. In addition, absorbent pads were installed to capture water samples from the alcove crown.

Although electrical power remained off, moisture-monitoring data collection behind the bulkheads (including temperature and relative humidity, barometric pressure, and wind speed) continued, with at least 15 of the 23 data-loggers still operating. Remote connection cannot be made to two loggers; those instruments may or may not be collecting data. For the remaining six loggers, battery voltage apparently has fallen below required levels, causing interruption of data collection. A decision has been made to use AGM (Absorbed Glass Matt) batteries, which should deliver enough power to supply the data loggers and instruments for a year. A bulkhead re-entry to replace and maintain bulkhead moisture-monitoring equipment tentatively is scheduled for late August. In spite of such difficulties, routine moisture-monitoring data transfer from the TCO occurred, and those data underwent preliminary processing.

Investigation of chemical and isotopic composition of pore water from core samples continued. Water samples centrifuged from CHEMSAMP3 core from the Drift-Scale Test are being analyzed for major cations, and moisture contents are being measured for samples from zones anticipated to be near the wetting front in the CHEMSAMP3 borehole.

Strontium concentrations and $^{87}Sr/^{86}Sr$ isotopic ratios place geochemical constraints on the composition of ground water, a typically useful relation in distinguishing complex flow paths down-gradient from Yucca Mountain. Alluvial ground-water samples from the Nye County early-warning drilling program (NC-EWDP) boreholes (and from additional holes in the area) differ, however, in exhibited Sr characteristics and thereby indicate multiple isolated flow paths and little interconnection of flow paths. Differences in the Sr concentrations and the very large range of $^{87}Sr/^{86}Sr$ ratios (0.70950 — 0.71557) of the ground-water samples from NC-EWDP boreholes make Sr a good tracer with which to understand ground-water flow paths. The Sr data do support a picture of general north-to-south ground-water flow, but there are insufficient data available to make more specific conclusions regarding genetic relations among and between boreholes. The present Sr data describe a part of the hydrochemical baseline information for the Yucca Mountain site, and Sr compositions therefore will be monitored for future changes.

K. Futa, B. Marshall, T. Oliver, and Z. Peterman, ***Strontium Isotopes in Ground Water in the Vicinity of Yucca Mountain, Nevada***, p. 367-372.

Uranium (U-series) delineation of UZ flow zones continued, with work on core from borehole USW SD-9. The purpose of that work is to identify vertical differences in U-series disequilibrium (using the ratios $^{234}U/^{238}U$ and $^{230}Th/^{238}U$) that might be related to lithostratigraphy, and, in particular, to evaluate the effect of percolation on general water/rock interactions above and below the Paintbrush nonwelded hydrogeologic (PTn) unit. Procurement of a mass spectrophotometer was approved, and the associated contract is being processed.

Early (c.1993) analyses designed to provide information about the amount and spatial distribution of water infiltrating the UZ at Yucca Mountain found anomalously high amounts of a chlorine isotope (^{36}Cl) associated with some faults in the ESF, within the

approximate volume of the proposed repository. Because ^{36}Cl was produced in atmospheric nuclear bomb testing in the 1950s, its apparent presence in the ESF indicated rapid movement of water from the surface to the ESF and raised very important issues regarding suitability of the Yucca Mountain site. Unsuccessful attempts to replicate those results, however, led to questions about sample preparation and analytical techniques, particularly regarding extraction of ^{36}Cl from samples. With observation that variable amounts of Cl can be leached depending on method of sample preparation, (crushed) size of sample fragments, duration of leaching, and possible contamination (from construction sources), experiments conducted on dry-drilled core from the Topopah Spring Tuff concluded that crushing of samples to small grain size reduced time required for meaningful leaching of chloride from 24 hours to about 10 min. Crushing to 0.063 mm increased maximum Cl leaching but still allowed extraction of only some 10% of the Cl in the rock (indicating that much Cl was chemically bound in hydrous mineral phases such as biotite). Leachable Cl in coarse rock fractions decreased with proximity to the Sundance fault zone and may reflect removal of Cl by infiltration moving down that fault zone. Details of leaching performance, varying leach times, and grain sizes on Cl concentration in leaching fluids may improve sampling and testing for ^{36}Cl abundance and understanding of ^{36}Cl in the rock.

M. Gascoyne, ***Soluble Salts in the Yucca Mountain Tuff and their Significance***, p. 340-347

Leachates of welded tuffs from underground drill core in the vicinity of the Sundance fault zone, central Yucca Mountain, Nevada, were analyzed for Cl concentrations and $^{36}Cl/Cl$ ratios in other attempts to reproduce the elevated $^{36}Cl/Cl$ compositions reported in previous studies. After the initial method was determined to be too aggressive, the leaching method was changed to a 1-hour soak in deionized water so that leachates would be dominated by the most recent, labile Cl components. Resulting Cl concentrations and $^{36}Cl/Cl$ ratios are systematically lower than those reported previously, with no correlation between Cl concentrations and $^{36}Cl/Cl$ ratios, indicating that the low $^{36}Cl/Cl$ values observed in this study cannot be the result of addition of ancient rock Cl or laboratory contamination with a low $^{36}Cl/Cl$ source. Instead, these results are consistent with the meteoric Cl signal observed in other areas where "bomb-pulse" Cl signals were never reported. Therefore, a statistically significant number of analyses—analytically sensitive to small amounts of Cl from recently added percolation—failed to verify the presence of "bomb-pulse" ^{36}Cl within a zone where a large percentage of samples with "bomb-pulse" Cl signatures previously had been reported. Other available isotopic data likewise show no evidence for fast-path percolation in the vicinity of the Sundance fault.

J.B. Paces, Z. Peterman (both USGS); L. Neymark (USGS-Stoller); G. Nimz (LLNL), M. Gascoyne (GeoProjects), and B. Marshall (USGS), ***Summary of Chlorine-36 Validation Studies at Yucca Mountain, Nevada***, p. 348-356.

In on-going work on extraction of microclimate records from the chemistry of fracture minerals, samples of secondary minerals were examined for potential use in ion-probe studies. Work was completed on draft purchasing documents and QC sample plan for ion-microprobe work to be carried out at UCLA. Mineral mounts were prepared, and U-series measurements began on opal samples.

WATER-RESOURCES MONITORING

Routine monitoring of water resources continued. Ground-water levels were measured at 34 sites, and ground-water discharge was measured at five springs and at one flowing well. Ground-water and spring-discharge data collected during May were checked and filed. In related efforts, USGS staff met with DOE to discuss changes in the ground-water network for next fiscal year.

Compilation by Mark Kurzmack and Michael Fahy, U.S. Geological Survey, Yucca Mountain Project Branch, due to illness of the regular author.

USGS Milestone Report

October 1, 2002 - June 30, 2003

Sorted by Baseline Date

Level: 3

Deliverable		Due Date	Expected Date	Completed Date
PAGSC2040D	Training Cost Information Annual Update	12/19/2002	12/12/2002	12/12/2002
PAGSC2050D	Annual Training Plan	6/30/2003	6/26/2003	6/26/2003
PAGSC2060D	Annual Training Needs Assessment	6/30/2003	6/26/2003	6/26/2003

USGS Milestone Report

October 1, 2002 - June 30, 2003

Sorted by Baseline Date

Level: 4

Deliverable		Due Date	Expected Date	Completed Date
PAGSW932M4	Supplemental Fracture Data to TDB/RPC	10/25/2002	11/1/2002	11/1/2002
PAGSW258M4	Letter Report: 4th Qtr FY02	10/31/2002	10/31/2002	10/31/2002
PAGSM930M4	USGS Dir. Approval of Map of S. Expansion Area	11/8/2002	7/31/2003	
PAGSW930M4	Phase II Lithophysal Data to TDMS/RPC	11/15/2002	1/31/2003	1/31/2003
PAGSW931M4	Phase I Lithophysal Data to TDB/RPC	11/15/2002	1/31/2003	1/31/2003
PAGSM935M4	S. Expansion Area Data to TDMS/RPC	11/26/2002	8/29/2003	
PAGSZ132M4	Interpretive Rpt on Opal Geochronology	12/13/2002	12/13/2002	12/13/2002
PAGSZ651M4	Interpretive Rpt on Initial U-series Data	12/13/2002	12/13/2002	12/13/2002
PAGSM920M4	Phase 3 Lithologies Data Pkg to TDMS/RPC	12/17/2002	2/18/2003	2/18/2003
PAGSZ303M4	Final Report to Customer & TDMS	12/27/2002	9/26/2003	
PAGSW530M4	Rock Mech (Direct Shear) Data to TDMS/RPC	1/10/2003	6/13/2003	6/13/2003
PAGSW260M4	Letter Report: 1st Qtr FY03	1/31/2003	1/31/2003	1/31/2003
PAGSM925M4	Phase 3 X-sections DP to TDMS/RPC	2/21/2003	5/21/2003	5/21/2003
PAGSW22M4	Fault Infiltration/Tracer Exp Data Pkg--TDMS/RPC	2/28/2003	3/14/2003	3/14/2003
PAGSW937M4	Spot & Rim Hydrologic Prop DP - TDMS/RPC	3/31/2003	4/30/2003	4/30/2003
PAGSW262M4	Letter Report: 2nd Qtr FY03	4/30/2003	4/30/2003	4/30/2003
PAGSW605M4	Fract & Lithophysal Char Final Data to TDMS/RPC	5/30/2003	10/17/2003	
PAGSW85M4	ESF Moisture Monitoring Data Pkg to TDMS/RPC	5/30/2003	10/27/2003	
PAGSM203M4	Phase IV Lithostrat Data to TDMS/RPC	6/2/2003	9/30/2003	

USGS Milestone Report

October 1, 2002 - June 30, 2003

Sorted by Baseline Date

Level: 4

Deliverable		Due Date	Expected Date	Completed Date
PAGSM435M4	ATC Barometric Monitoring Data to TDMS/RPC	6/2/2003	9/30/2003	
PAGSW26M4	Plot Infiltration/Tracer Exp Data Pkg - TDMS/RPC	6/30/2003	6/30/2003	6/30/2003

USGS Milestone Report

October 1, 2002 - June 30, 2003

Sorted by Baseline Date

Level: 5

Deliverable		Due Date	Expected Date	Completed Date
PAGSM37EM5	Mtg Summary to TPO	10/31/2002	10/25/2002	10/25/2002
PAGSM37FM5	Mtg Summary to TPO	11/29/2002	11/29/2002	11/29/2002
PAGSM30AM5	Intro Chap Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM32CM5	Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM32EM5	Mid-Year Progress HFM Discretization	12/31/2002	12/19/2002	12/19/2002
PAGSM32GM5	Prg Rpt - Updates Based on Hydrgeo Parameteriztn	12/31/2002	12/19/2002	12/19/2002
PAGSM34CM5	Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM373M5	Annotated Outline of Report to TPO	12/31/2002	12/18/2002	12/18/2002
PAGSM37GM5	Mtg Summary to TPO	12/31/2002	12/20/2002	12/20/2002
PAGSM32AM5	Progress HFM Updates - Transient Model	1/31/2003	1/31/2003	1/31/2003
PAGSM37HM5	Mtg Summary to TPO	1/31/2003	2/7/2003	2/7/2003
PAGSM30BM5	Update Hydrogeologic Data Integration Progress	2/28/2003	2/28/2003	2/28/2003
PAGSM36AM5	Update on Predictive Capability Progress	2/28/2003	2/28/2003	2/28/2003
PAGSM37AM5	Memo to TPO: Completion - Editing Intro Chapters	2/28/2003	2/28/2003	2/28/2003
PAGSM37IM5	Mtg Summary to TPO	2/28/2003	2/28/2003	2/28/2003
PAGSM32DM5	Report Contribution to Report Editor	3/31/2003	3/31/2003	3/31/2003
PAGSM34AM5	Progress Report Flow Modeling	3/31/2003	3/31/2003	3/31/2003
PAGSM37JM5	Mtg Summary to TPO	3/31/2003	3/31/2003	3/31/2003
PAGSM202M5	Phase IV Lithostrat Data to USGS DMG	4/1/2003	9/19/2003	

USGS Milestone Report

October 1, 2002 - June 30, 2003

Sorted by Baseline Date

Level: 5

Deliverable		Due Date	Expected Date	Completed Date
PAGSM434M5	ATC Barometric Monitoring Data to DMU	4/1/2003	7/30/2003	
PAGSM37KM5	Mtg Summary to TPO	4/30/2003	4/30/2003	4/30/2003
PAGSM37BM5	Memo to TPO: Completion - Editing HFM/Db Chap	5/30/2003	5/30/2003	5/30/2003
PAGSM37LM5	Mtg Summary to TPO	5/30/2003	6/6/2003	6/6/2003
PAGSM32BM5	Progress HFM Updates - Transient Model	6/30/2003	6/30/2003	6/30/2003
PAGSM34DM5	Report Contribution to Report Editor	6/30/2003	6/30/2003	6/30/2003
PAGSM37MM5	Mtg Summary to TPO	6/30/2003	6/30/2003	6/30/2003

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
Date Prepared 7/11/2003 12:10 PM

Fiscal Month/Year June 30, 2003
Page 1 of 1

	CURRENT MONTH END						FISCAL YEAR		
WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCONTRACT HOURS	PURCHASE COMMITMENTS	SUBCONTRACT COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.5.01.01	196	1977	231	0	88	0	3444	0	2256
1.5.01.05	29	355	345	0	0	0	543	0	344
1.5.01.06	53	426	688	0	110	0	748	0	464
1.5.01.07	40	425	10	0	0	0	579	0	339
1.5.01.09	134	1226	1073	0	105	0	2326	0	1519
1.5.03.03	197	1653	1770	0	211	0	2077	0	1542
1.5.03.04	318	2224	484	0	32	0	1975	0	1265
1.5.03.07	76	410	40	0	23	0	1430	0	979
1.5.03.13	11	268	111	0	152	0	175	0	39
1.5.03.14	1	36	0	0	33	0	150	0	47
	1055	9000	4752	0	754	0	13447	0	8794

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR October 1, 2002 - June 30, 2003
7/11/2003 12:13:12 PM

		OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
4568-9U001	Science Advisors	41.0	37.7	36.8	42.2	42.0	46.8	39.6	32.6	42.3	0.0	0.0	0.0	360.93
4568-9U010	Publications	19.2	34.2	3.9	8.3	11.4	7.8	3.9	4.0	53.9	0.0	0.0	0.0	146.62
4568-9U040	Tectonics	21.5	10.3	1.7	4.6	6.0	3.3	0.0	2.4	7.2	0.0	0.0	0.0	57.00
4568-9U041	Water Levels	3.4	0.0	4.7	0.9	2.8	3.0	6.5	0.1	4.0	0.0	0.0	0.0	25.38
4568-9U042	Geophysics	0.0	0.4	0.0	0.0	0.0	0.0	5.3	-1.5	0.0	0.0	0.0	0.0	4.26
4568-9U060	Mapping Expertise (USBR)	14.6	8.0	4.5	9.2	6.1	5.8	3.7	15.4	7.9	0.0	0.0	0.0	75.12
4568-9U081	Geochemistry	11.7	11.5	11.2	11.4	8.3	729.0	0.1	1.3	1.2	0.0	0.0	0.0	785.83
819Y01	USGS Technical Advisory Capability	111.4	102.2	62.8	76.6	76.6	795.7	59.0	54.3	116.6	0.0	0.0	0.0	1,455.13
4568-9U002	Br Chief, Asst Br Chief, Deputy TPO, Tea	38.5	63.0	53.9	68.1	91.7	91.2	44.2	27.7	36.6	0.0	0.0	0.0	514.88
819Y11	USGS Branch Management	38.5	63.0	53.9	68.1	91.7	91.2	44.2	27.7	36.6	0.0	0.0	0.0	514.88
4568-9U003	Planning & Project Control	27.4	23.4	32.8	33.1	24.0	31.1	42.5	28.9	42.7	0.0	0.0	0.0	285.81
819Y21	USGS Planning & Project Control	27.4	23.4	32.8	33.1	24.0	31.1	42.5	28.9	42.7	0.0	0.0	0.0	285.81
1.5.01.01	Project Support - Project Manageme	177.2	188.6	149.5	177.8	192.3	918.0	145.7	110.9	195.8	0.0	0.0	0.0	2,255.82
1.5.01		177.2	188.6	149.5	177.8	192.3	918.0	145.7	110.9	195.8	0.0	0.0	0.0	2,255.82
4568-9U030	Regulatory Compliance Support	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	0.0	0.0	0.0	344.45
819Y31	USGS Regulatory Compliance Support	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	0.0	0.0	0.0	344.45
1.5.01.05	Project Support - Compliance Manag	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	0.0	0.0	0.0	344.45
1.5.01		40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	0.0	0.0	0.0	344.45
4568-9U024	Computer/Network Support	26.4	25.5	23.6	27.2	24.8	19.3	32.2	25.6	28.0	0.0	0.0	0.0	232.65
819Y15	USGS Commputer/Network Support	26.4	25.5	23.6	27.2	24.8	19.3	32.2	25.6	28.0	0.0	0.0	0.0	232.65
4568-9U025	Property Management	24.1	20.5	27.0	23.4	20.2	32.5	29.5	28.9	25.3	0.0	0.0	0.0	231.42
819Y16	USGS Property Management	24.1	20.5	27.0	23.4	20.2	32.5	29.5	28.9	25.3	0.0	0.0	0.0	231.42
1.5.01.06	Project Support - Information Manag	50.6	46.0	50.6	50.6	44.9	51.8	61.7	54.5	53.4	0.0	0.0	0.0	464.07
1.5.01		50.6	46.0	50.6	50.6	44.9	51.8	61.7	54.5	53.4	0.0	0.0	0.0	464.07
4568-9U061	Water Resources Monitoring	16.8	32.5	26.7	22.2	31.1	3.6	75.2	19.9	29.9	0.0	0.0	0.0	257.94
819Y41	USGS Water Resources Monitoring	16.8	32.5	26.7	22.2	31.1	3.6	75.2	19.9	29.9	0.0	0.0	0.0	257.94
4568-9U062	Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	0.0	0.0	0.0	81.11

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819Y51	USGS Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	0.0	0.0	0.0	81.11
1.5.01.07	Project Support - Environmental, Saf	25.9	41.9	35.9	31.5	40.9	12.4	83.5	26.9	40.1	0.0	0.0	0.0	339.05
1.5.01		25.9	41.9	35.9	31.5	40.9	12.4	83.5	26.9	40.1	0.0	0.0	0.0	339.05
4568-9U011	Reports Specialists	18.0	18.5	18.5	20.1	17.4	17.3	18.3	13.7	14.8	0.0	0.0	0.0	156.47
4568-9U012	Data Management	49.3	30.9	31.3	35.4	33.8	33.7	34.5	34.7	34.9	0.0	0.0	0.0	318.59
4568-9U013	Records Support	22.2	2.8	4.5	5.7	21.5	-9.1	6.1	7.0	7.1	0.0	0.0	0.0	67.66
4568-9U014	QAS Support	7.0	6.4	7.3	12.5	29.6	-21.7	6.4	6.6	0.2	0.0	0.0	0.0	54.38
819Y12	USGS Data, Records & Reports	96.5	58.6	61.6	73.6	102.3	20.1	65.4	62.0	57.0	0.0	0.0	0.0	597.10
4568-9U021	Administrative Support & Personnel Servi	33.2	34.8	34.1	67.5	26.0	75.8	15.0	18.2	26.2	0.0	0.0	0.0	330.90
4568-9U022	Facilities Management	0.0	0.0	0.2	10.8	43.0	55.2	218.1	87.4	42.8	0.0	0.0	0.0	457.60
819Y13	USGS Administration & Facilities	33.2	34.8	34.3	78.3	69.0	131.0	233.1	105.6	69.0	0.0	0.0	0.0	788.49
4568-9U023	Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	0.0	0.0	0.0	133.83
819Y14	USGS Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	0.0	0.0	0.0	133.83
1.5.01.09	Project Support - General Project Ser	145.5	110.6	121.2	170.5	178.2	164.8	314.4	180.0	134.3	0.0	0.0	0.0	1,519.43
1.5.01		145.5	110.6	121.2	170.5	178.2	164.8	314.4	180.0	134.3	0.0	0.0	0.0	1,519.43
4568-9U050	Alcove 7/X-Drift Instrument Strains	7.8	5.5	3.9	20.4	7.7	0.2	3.8	2.2	4.7	0.0	0.0	0.0	56.15
4568-9U063	Alcove 8/Niche 3 Infiltration	25.9	22.1	29.9	21.4	28.3	22.4	21.5	23.4	17.1	0.0	0.0	0.0	212.08
4568-9U064	Moisture Monitoring ESF & X-Drift	19.2	14.7	13.3	20.8	11.6	23.6	13.6	19.2	53.2	0.0	0.0	0.0	189.36
4568-9U065	Bulkhead Moisture Monitoring	8.2	7.7	21.4	17.6	14.9	32.4	-14.9	33.4	26.3	0.0	0.0	0.0	146.84
4568-9U066	Support to UZ In-Situ Processes AMR	7.3	7.7	2.6	5.0	-0.9	0.2	9.2	5.6	6.6	0.0	0.0	0.0	43.38
AUZG01	USGS UZ Moisture Studies	68.4	57.6	71.2	85.3	61.6	78.8	33.1	83.8	107.9	0.0	0.0	0.0	647.82
4568-9U085	U-Series Delineation of UZ Flow Zones	26.8	5.8	20.1	17.3	9.2	3.7	13.4	15.1	10.8	0.0	0.0	0.0	122.18
4568-9U086	Complete Chlorine 36 Validation	5.0	13.8	11.8	9.9	24.3	10.9	13.0	28.7	19.7	0.0	0.0	0.0	137.12
4568-9U087	Chemical & Isotopic Composition of Pore	30.4	38.0	52.2	32.4	25.3	23.6	36.4	16.1	21.9	0.0	0.0	0.0	276.18
4568-9U088	ECRB H2O, H2O Vapor & Gas Chemistry	0.0	4.6	1.6	0.3	5.2	26.8	9.2	1.8	5.6	0.0	0.0	0.0	55.08
4568-9U089	Microclimate Records in Fracture Mineral	13.9	17.0	13.3	16.6	20.1	41.8	28.2	20.7	26.4	0.0	0.0	0.0	197.79
AUZG02	USGS UZ Isotope Hydrology	75.9	79.2	99.0	76.6	83.9	106.8	100.2	82.4	84.4	0.0	0.0	0.0	788.35
4568-9U090	Isotope Support for Thermal Testing	7.9	12.9	18.7	29.0	-2.5	12.5	16.5	6.4	4.5	0.0	0.0	0.0	105.90

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AUZG03	USGS Drift-Scale Test ESF	7.9	12.9	18.7	29.0	-2.5	12.5	16.5	6.4	4.5	0.0	0.0	0.0	105.90
1.5.03.03	Safety Analyses - Unsaturated Zone	152.2	149.7	188.9	190.9	143.1	198.1	149.8	172.6	196.8	0.0	0.0	0.0	1,542.06
1.5.03		152.2	149.7	188.9	190.9	143.1	198.1	149.8	172.6	196.8	0.0	0.0	0.0	1,542.06
4568-9U043	Hydrogeologic Data Integration	13.4	12.2	-2.6	4.0	3.5	114.0	-47.9	17.2	99.6	0.0	0.0	0.0	213.41
4568-9U044	3D Hydrogeologic Model Development	1.2	0.5	0.5	5.4	0.0	0.0	22.0	18.4	104.2	0.0	0.0	0.0	152.10
4568-9U045	Flow Model Calibration and Evaluation	3.9	8.1	6.6	5.7	8.8	47.8	6.6	8.4	24.0	0.0	0.0	0.0	119.87
4568-9U046	DVRFS Knowledge Exchange Protocol	0.0	0.0	0.0	0.0	0.0	0.0	37.0	23.3	9.6	0.0	0.0	0.0	69.98
4568-9U047	DVRFS Predictive Capability	0.0	0.0	0.0	0.0	0.0	69.6	0.0	0.0	0.0	0.0	0.0	0.0	69.62
819Y61	USGS Death Valley Regional Flow Mod	18.5	20.7	4.5	15.0	12.3	231.5	17.7	67.4	237.4	0.0	0.0	0.0	624.99
4568-9U048	Cross-hole Hydraulic & Tracer Testing AT	27.4	27.2	18.7	14.6	17.3	21.7	14.0	25.1	22.3	0.0	0.0	0.0	188.33
4568-9U049	Nye County EWDP Borehole Lithostratigr	12.3	10.2	1.1	17.9	10.0	10.6	16.0	7.9	10.9	0.0	0.0	0.0	97.16
4568-9U051	Deferred - Lithostratigraphic Support to N	0.0	0.0	18.6	4.2	-1.5	0.0	1.3	1.2	0.1	0.0	0.0	0.0	23.94
4568-9U052	Deferred - X-Hole Hydraulic & Tracer Tstg	0.0	0.0	14.6	7.1	13.0	8.8	8.7	2.6	8.1	0.0	0.0	0.0	62.88
4568-9U053	Deferred - Map Proposed Repository Exp	0.0	0.0	0.0	0.0	0.0	0.0	9.0	-0.4	7.5	0.0	0.0	0.0	16.09
4568-9U072	Support to Proposed Surface Workover T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
ASZG01	USGS SZ Investigations	39.8	37.5	53.1	43.7	38.8	41.1	49.0	36.5	48.9	0.0	0.0	0.0	388.40
4568-9U082	Isotopic/Hydrochemical Support to the AT	0.0	4.1	0.0	0.2	0.1	1.6	0.0	-1.2	1.2	0.0	0.0	0.0	5.99
4568-9U083	Hydrochronology of the Yucca Mountain	0.0	0.0	0.0	0.0	11.8	-1.3	0.6	0.1	0.8	0.0	0.0	0.0	12.11
4568-9U084	Site-Scale Hydrochemistry	19.4	-0.1	15.8	15.0	6.3	13.5	47.1	25.2	19.8	0.0	0.0	0.0	162.13
4568-9U092	Isotope/Hydrochemical Support to Nye C	7.7	23.9	-1.4	6.4	17.1	-7.7	6.2	9.5	9.8	0.0	0.0	0.0	71.58
ASZG02	USGS SZ Isotope Hydrology	27.1	28.0	14.4	21.6	35.4	6.1	53.9	33.6	31.7	0.0	0.0	0.0	251.81
1.5.03.04	Safety Analyses - Saturated Zone Flo	85.4	86.3	72.0	80.3	86.5	278.7	120.7	137.5	318.0	0.0	0.0	0.0	1,265.20
1.5.03		85.4	86.3	72.0	80.3	86.5	278.7	120.7	137.5	318.0	0.0	0.0	0.0	1,265.20
4568-9U091	Geochem/Physical Characterization of E	2.1	2.8	1.8	3.8	1.5	38.4	4.1	2.7	0.4	0.0	0.0	0.0	57.73
AEBG01	USGS Effects of Water-Rock Interactio	2.1	2.8	1.8	3.8	1.5	38.4	4.1	2.7	0.4	0.0	0.0	0.0	57.73
4568-9U067	Quantify Lithophysal Porosity - In Situ Te	8.1	7.5	5.4	8.2	-0.2	1.2	0.5	0.4	0.4	0.0	0.0	0.0	31.39
4568-9U070	Deferred - Core & Lithophysae Char Tstg	0.0	0.1	0.9	6.1	5.3	27.8	18.7	-2.8	-0.5	0.0	0.0	0.0	55.62
AEBG02	USGS Nevada Operations Support to E	8.1	7.6	6.3	14.3	5.1	29.0	19.2	-2.5	-0.1	0.0	0.0	0.0	87.01

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4568-9U068	Rock Mechanics Testing in the ECRB (U	91.5	53.5	28.2	46.4	35.2	6.1	7.7	16.1	2.7	0.0	0.0	0.0	287.42
4568-9U069	Fracture & Lithophysal Characteristics of	43.7	53.1	48.7	81.5	65.1	31.0	45.3	99.9	72.2	0.0	0.0	0.0	540.42
4568-9U071	Deferred - QAS & Checking Support USB	0.0	0.0	2.1	3.6	0.2	0.0	0.0	0.0	0.7	0.0	0.0	0.0	6.61
AEBG03	USBR Testing Activities in Support of D	135.2	106.5	79.1	131.5	100.4	37.2	53.0	115.9	75.6	0.0	0.0	0.0	834.44
1.5.03.07	Safety Analyses - EBS Performance	145.4	116.9	87.2	149.6	107.0	104.6	76.3	116.2	75.9	0.0	0.0	0.0	979.18
1.5.03		145.4	116.9	87.2	149.6	107.0	104.6	76.3	116.2	75.9	0.0	0.0	0.0	979.18
4568-9U016	USGS Data Verification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	14.9	0.0	0.0	0.0	25.82
APAGD5	USGS Data Verification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	14.9	0.0	0.0	0.0	25.82
4568-9U015	USGS Data Verification	0.0	0.0	1.0	2.1	1.1	5.8	6.2	1.2	-4.0	0.0	0.0	0.0	13.35
DTAG01	USGS Data Verification	0.0	0.0	1.0	2.1	1.1	5.8	6.2	1.2	-4.0	0.0	0.0	0.0	13.35
1.5.03.13	Safety Analyses - Technical Data Ma	0.0	0.0	1.0	2.1	1.1	5.8	6.2	12.1	10.9	0.0	0.0	0.0	39.17
1.5.03		0.0	0.0	1.0	2.1	1.1	5.8	6.2	12.1	10.9	0.0	0.0	0.0	39.17
4568-9U004	USGS Support to Site Description	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	0.0	0.0	0.0	46.94
4568-9U006	Support to LANL Cesium Study	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
ANSG01	USGS Support to Site Description	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	0.0	0.0	0.0	46.94
1.5.03.14	Safety Analyses - Yucca Mountain SI	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	0.0	0.0	0.0	46.94
1.5.03		7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	0.0	0.0	0.0	46.94
1.5		830.3	788.5	754.5	899.1	843.8	1,779.4	1,011.1	833.9	1,054.8	0.0	0.0	0.0	8,795.38
1.5 OPERATING		830.3	788.5	754.5	899.1	843.8	1,779.4	1,011.1	833.9	1,054.8	0.0	0.0	0.0	8,795.38
CAPITAL EQUIPMENT		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRAND TOTAL		830.3	788.5	754.5	899.1	843.8	1,779.4	1,011.1	833.9	1,054.8	0.0	0.0	0.0	8,795.38
FTEs														
	FEDERAL	62.3	75.5	50.2	52.7	54.6	52.2	61.4	61.2	60.1	0.0	0.0	0.0	
	CONTRACT	34.7	26.8	27.1	29.2	26.6	29.2	33.5	34.2	30.5	0.0	0.0	0.0	
	TOTAL	97.0	102.4	77.3	81.9	81.2	81.5	94.8	95.3	90.5	0.0	0.0	0.0	