



**Department of Energy**  
Office of Civilian Radioactive Waste Management  
Yucca Mountain Site Characterization Office  
P.O. Box 364629  
North Las Vegas, NV 89036-8629

QA: N/A

**JAN 11 2002**

**OVERNIGHT MAIL**

N. King Stablein, Chief  
Projects and Engineering Section  
High Level Waste Branch  
Division of Waste Management  
Office of Nuclear Material Safety & Safeguards  
U.S. Nuclear Regulatory Commission  
Two White Flint North  
Rockville, MD 20852

**SUBMITTAL OF PARTICIPANTS' MONTHLY PROGRESS REPORT**

As you have requested, the U.S. Nuclear Regulatory Commission is on distribution to receive a copy of the Yucca Mountain Site Characterization Project participants' monthly status report on a regular basis. Enclosed is the U.S. Geological Survey Progress Report for November 2001.

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

A handwritten signature in black ink, appearing to read "Stephan Brocoum".

Stephan Brocoum  
Assistant Manager, Office of  
Licensing and Regulatory Compliance

OL&RC:BMT-0458

Enclosure:  
Ltr, 12/13/01, Craig to Trebules, w/encl

*NMSS07  
WM-11*

JAN 11 2002

cc w/encl:

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# United States Department of the Interior

U. S. GEOLOGICAL SURVEY

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Denver Federal Center

Denver, Colorado 80225

IN REPLY REFER TO:

INFORMATION ONLY

December 13, 2001

Victor W. Trebules  
Director, Office of Project Control  
Yucca Mountain Site Characterization  
Project Office  
U. S. Department of Energy  
P.O. Box 364629  
Las Vegas, Nevada 89036-8629

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)  
Progress Report, November, 2001

Attached is the USGS progress report in the required format for the month of November, 2001.

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

Sincerely,

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

Enclosure:

cc: J. Bresee, DOE/OCRWM-HQ/Forrestal  
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# U.S. GEOLOGICAL SURVEY EXECUTIVE SUMMARY

November 2001

## GEOLOGY

Activity for geologic mapping of possible repository expansion continued. During November, the test plan for proposed mapping of repository expansion areas was completed. That document received reviews from DOE staff and USGS-YMPB staff, and after all review comments were addressed, the test plan was submitted for final signature and acceptance. In other mapping-related work, a digital template for the 1:6,000-scale detailed geologic map of the southern potential expansion area was created. That template includes all of the geology, in digital form, published on the 1:24,000-scale "Bedrock geologic map of the Yucca Mountain area, Nye County, Nevada," by Day, Dickerson, and others (1998). That digital map has allowed identification of those areas currently mapped in least detail, as well as those areas which manifest the greatest structural complexity in and near the footprint of the southern expansion area. This information has been used to plan the first session of field mapping, scheduled for the last week in November. Also, an early draft of a written report to accompany the geologic map has been started; it will describe the stratigraphy, structure, and regional geologic setting of the southern expansion area. Initial drafting of that document has clarified types of stratigraphic and structural information currently missing from the Project, which need to be collected during field mapping sessions to address specific geologic issues relative to the southern expansion area.

Investigations of buried basaltic volcanic centers continued. Reviews and preliminary revisions were completed to a draft USGS open-file report, entitled *Aeromagnetic expression of buried basaltic volcanoes near Yucca Mountain, Nevada*, by D. O'Leary, E. Mankinen, R. Blakely, V. Langenheim, and D. Ponce. A presentation entitled *Tectonic controls on Plio-Pleistocene volcanism in the Yucca Mountain region* was given in Boston on November 9 by D. O'Leary at the annual Geological Society of America national meeting. Preparations continued for expansion of that presentation into a manuscript of the same title, which will discuss tectonic controls relevant to spatial distribution and character of potential future basaltic eruptions in the vicinity of Yucca Mountain. Staff also prepared for a meeting to be held November 28 in Las Vegas to discuss eruptive events and volcanic hazards, including need for further work to resolve outstanding issues or to reduce uncertainty regarding volcanism and attendant hazards. That meeting will address remaining work-package tasks for disruptive events.

Revisions to Chapter N for the Paleoseismic Data Report represented work on the Deterministic Seismic Hazard Analysis (DHSA). Those data provide direct input to DHSA as a synthesis of paleoseismic trenching data and chronology presented in 13 chapters released in the USGS Seismotectonic Synthesis Report of 1996. The Deterministic Earthquake (the largest actual earthquake revealed in the geologic record)

occurred approximately 70,000 yrs ago, involved displacement on all principal block-bounding faults at Yucca Mountain, and is marked in the geologic record by a basaltic volcanic ash. Investigations of that event in greater detail and development of refined seismotectonic and volcanotectonic scenarios for hazard assessments and disruptive-events models are on-going efforts. The Deterministic Earthquake appears associated with an eruption that triggered displacement on block-bounding faults at Yucca Mountain, and that earthquake provides important upper bounds to disruptive-events models.

The Underground Mapping Team began collecting data for the Phase II Lithophysal Study. Sample locations were picked in the ESF and the ECRB tunnels for rock-mechanics testing in the ECRB. Support to the Waste Handling Building activity continued, with efforts toward completion of data submittals and assistance with AMR production. In the deferred work category, technical review of field data began for the Supplemental Surface Fracture Study.

## SATURATED-ZONE STUDIES

In work on deferred activities, preparation of the water-level AMR continued. Responses to AP-2.14Q review comments were prepared, and those replies were returned to reviewers on November 26 for informal concurrence. A revised draft of the AMR was sent to the checkers for preliminary back check. Data-qualification efforts (for the unqualified Nye County water-level data) were initiated by C. Taylor (BSC). (Note that AP-2.14Q and checker concurrence must await data qualification, expected shortly.) Differences in water levels recently posted on the Nye County web site from data used in the AMR resulted from revised land-elevation data based on surveys performed in March 2001. In all cases, elevation differences are less than 1 m and should have no impact on the analysis documented in the AMR.

Revision of the water-level AMR includes a potentiometric-surface map that presents an alternate conceptual model for the large-hydraulic-gradient area north of Yucca Mountain, and it also includes tabulation of vertical head differences at various locations within the site-scale saturated-zone flow and transport model area. The alternate conceptual model assumes that water levels in wells USW G-2 and UE-25 WT#6 represent perched conditions, resulting in a hydraulic gradient that is reduced from about 0.11 to about 0.07. Potentiometric contours in southern Crater Flat and along Highway 95 also were revised based on Nye County Phase II early warning drilling program (EWDP) water-level data. Vertical head differences between the shallowest and deepest monitored intervals at 17 sites range from about 55 m (indicating an upward gradient) to -38 m (indicating a downward gradient).

Investigations based on cross-hole hydraulic and tracer testing at the Alluvial Test Complex (ATC) continued. Oversight of manufacturers' progress in instrumentation for cross-hole testing also continued. Installation in borehole NC-EWDP-IM1 of the Westbay Inc. MP (Multi-Piezometer) PVC casing with sliding-sleeve ports, packers, and

pressure and temperature transducers was performed by Westbay Inc., under Nye County supervision, during the week of November 12. Installation of instrumentation in borehole NC-EWDP-19D1 will begin shortly, with instrumentation of NC-EWDP-IM2 pending decisions regarding choice of screened intervals based on results of hydraulic tests from NC-EWDP-19D1.

The single-hole tracer-testing report will be a USGS Water Resources Investigations (WRI) Report on all of the single-hole hydraulic and tracer tests conducted from July 2000 to April 2001 in NC-EWDP-19D1, the first well drilled at the ATC. Work on the first draft of the report commenced in October 2001. No progress was made in November 2001 due to involvement of project personnel in preparations for the upcoming cross-hole testing at the ATC. A colleague-review copy is expected to be ready by February 2002.

Isotopic and hydrochemical work continued in support to the Nye County early warning drilling program (EWDP). The test plan for Nye County EWDP hydrochemistry was submitted for review on November 27. That test plan also covered details for similar analytical support to investigations at the Alluvial Test Complex (ATC) and to investigations of hydrochronology of the Yucca Mountain flow system. November sampling of Phase I and Phase II boreholes was cancelled by Nye County, but sampling at borehole M1 at the ATC was added. Phase I and Phase II borehole sampling has been scheduled tentatively for early February. Sampling was carried out in five zones in borehole M1 during the period November 14–16, in Phase III sampling work. Test results of that Phase III sampling are not available, but field parameters indicate ascending pH and alkalinity trends with depth from alluvium to lower zones of the volcanic aquifer. Whether these effects are artifacts of drilling fluid in the borehole or of natural conditions is not yet known.

In the deferred work category, a data package containing hydrochemical data from Nye County boreholes is complete, satisfying Level 4 **milestone SAGSZ900M4 [Hydrochemistry Data Package to TDB/RPC]** on November 28. Also completed on November 28 was a similar data package containing isotopic and hydrochemical data from boreholes at the ATC, in completion of Level 4 **milestone SAGSZ910M4 [ATC Isotope/Hydrochemical Data to TDB/RPC]**.

Investigations in support of modeling of the Death Valley regional flow system (DVRFS) continued. Further refinements to the regional-modeling data base continued. Staff worked with vendors (contractors) on improvements and clarifications to the data base to enhance modeling processes. On-going work to 3-D data structures and geodata-base issues continued. Regional GIS modeling data are being organized into an ARCGIS (v. 8.1) data base in Microsoft SQL SERVER; the SQL SERVER software appears to be the best choice for DVRFS application. Staff met to discuss transient head-observation weights and ways to utilize the data base in determining those weights. The weighting process for the steady-state model was evaluated, deficiencies were addressed, and a new method was initiated. Transient-model water-use data also were discussed, including schedules for delivery of water-use data. Additional water-use data needed for the

modeling were identified. As those data become available, they will be incorporated. Revisions were begun to the GWSI UTILITIES application to make it compatible with the NWIS data base (v. 4.1). Several elements were changed in the NWIS upgrade, causing errors in the daily data-base update from NWIS.

Refinements to the regional hydrogeologic framework model (HFM) also continued. Interpretive geologic cross sections were re-attributed and will be used in revision of the transient HFM. Back-up sets of cross sections were archived. Staff examined relation of hydraulic conductivity and rock properties to assess viability of direct input of rock-property data into flow-model data sets. Probability distributions and statistics of the hydraulic conductivity for various hydrogeologic units were examined to produce a Project-specific "Bedinger-type" plot for the DVRFS flow model. Text for the steady-state regional HFM report was approved for publication as USGS water-resources investigation report USGS-WRIR-01-4254 (*Three-dimensional hydrogeologic framework model for use with a steady-state numerical ground-water flow model of the Death Valley regional flow system, Nevada and California*, by W. Belcher, C. Faunt, and F. D'Agnese) and has been sent for final processing. Modifications to illustrations are underway. Staff from the modeling group attended a Probabilistic Volcanic Hazards Assessment meeting on November 28 to discuss use of aeromagnetic data to assess buried volcanic centers, and discussions were opened with Nye County for acquisition of aeromagnetic data to the east of the Nevada Test Site. It is expected that aeromagnetic data sets may contribute to improved understanding of structural controls represented in ground-water flow models. Drillers' logs for the Pahrump Valley were obtained. Analysis to identify potential alluvial units for use with the DVRFS transient flow model was initiated.

Ground-water flow modeling continued. Revisions to the modeling report were made in response to reviewer comments, and comment resolution began. On-going coordination with the water-use group pointed to development of transient input data sets. Pahrump pumpage was incorporated into the comprehensive water-use data base. Updates of water-level and water-use data for use in transient simulation continued. Software requirements for the post-processor to the flow model were summarized for the contractor for use as guidelines for development of integrative modeling software. Demonstration of post-processors was prepared. Steady-state model input data were ported into the new DVRFS pre-processor (v. 3.0).

Revisions to the site-scale hydrogeologic framework model (HFM) continued during the period, as new geologic information was incorporated. Preliminary versions of three new cross sections which employed subsurface geologic data from the Nye County EWDP boreholes were used for revisions the HFM. Scientific notebook entries are being used to revise the text for the HFM AMR. When completed, that AMR will be submitted for checker and technical review. New illustrations will be developed for the AMR text.



## UNSATURATED-ZONE STUDIES

The USGS continued monitoring of pressure, temperature, and water potential at stations located in boreholes UE-25 UZ #4, UE-25 UZ #5, and USW NRG-7a. As directed by the YMP Office, those boreholes will be shut down on or before December 20.

The USGS also continued the water-potential monitoring program in the vertical boreholes located in Alcoves 3 and 4. Preliminary review of the data for the period April 2000 to August 2001 indicated that the water-potential gradients in the two boreholes are different. The Alcove 3 data indicated that water potentials of the Paintbrush nonwelded (PTn) units 1) ranged from -50.8 bars to -0.3 bars, 2) required from 3 to 11 months to equilibrate after installation, and 3) demonstrated an increase in water potential with depth through most of the PTn. The Alcove 4 data indicated that the water potentials of the upper Topopah Spring unit 1) ranged from -4.3 bars to -0.7 bars, 2) required from 1 to 3 months to equilibrate after installation, and 3) showed a decrease in water potential with depth. An additional on-going effort monitored temperature, pressure, and moisture content at stations behind the bulkheads in Alcove 7. Preliminary review of those pressure data indicated that all stations, regardless of location, showed daily barometric fluctuation of 400 to 500 Pascals. The bulkheads do not dampen the barometric signal, but further analysis is necessary to resolve and quantify any time lag. Temperature monitoring indicated that the air temperature in front of the bulkheads fluctuated by several degrees Celsius, driven by the ESF ventilation system. Interestingly, temperatures behind both bulkheads showed only diurnal temperature fluctuations of 0.01 to 0.05 degrees Celsius; those fluctuations were totally independent of ESF ventilation. Monitoring with thermocouple psychrometers behind the bulkheads indicated that the relative humidity is less than 95%. (Interpretation of these values is pending apparent equilibration of the sensors after opening of the bulkheads and exposure to dry, ventilated ESF air.) Continued monitoring and analysis will further define and quantify the role of the ESF ventilation and the role of the Ghost Dance fault as they relate to the pressure, temperature, and relative humidity in Alcove 7. The USGS staff has begun reviewing and compiling the laboratory and field notebooks that will be part of the Alcoves 3 and 4 data package. The notebooks are required to identify and document all field equipment used in Alcoves 3 and 4 and to document the instrument calibrations.

Work in investigation of the chemical and isotopic composition of pore water continued. The draft test plan for that activity was completed and submitted for review on November 26. Extraction of pore water from ECRB samples using the ultracentrifuge continued in on-going work, as did chemical analysis. Progress was made on the draft test plan for isotopic investigations in support of Thermal Testing, but that plan remained incomplete. The new borehole (ESF-HD-CHEMSAMP-1) for water chemistry was completed, and a suite of preserved core samples was requested by the isotopic analysts on November 19.

In action on deferred activities, analysis of pore-water geochemistry continued. Major cation and anion analyses of pore water collected in FY2001 commonly show poor charge balance (an excess of cations over anions); investigations of that problem continued. Analysts currently are checking for the possibility of inaccurate alkalinity

titrations due, in part, to calcite precipitation. Cation analyses determined by inductively coupled plasma mass spectrometry (ICP-MS) have been verified by ion chromatography in one case where sufficient sample allowed multiple measurements. Until the charge-balance problem is resolved satisfactorily, however, those analyses will not be submitted. Resolution likely will delay final preparation of the data package, its checking, and the associated milestone. The Waste Package project and other users have been apprised of the preliminary data and efforts to resolve apparent data problems.

The draft test plan for activity in U-series delineation of UZ flow zones (SITP-02-UZ-007, UZ Hydrochemistry Investigations) was completed and submitted for technical and QA review. Those QA reviews now have been completed, and the plan currently is under revision. Arrangements have been made to visit the ESF and the east-west Cross Drift (EWCD) during early December. One of the goals of that visit will be to sample a hydrologically active area (the Bow Ridge fault, near the surface and known to contain elevated levels of both tritium and  $^{36}\text{Cl}$ ) as well as inactive areas (such as unfractured rock adjacent to the Bow Ridge fault and unfractured welded tuff of the TSw in the Cross Drift). Those samples will be used for initial characterization of high- and low-flux UZ areas.

In the deferred category, additional work is planned for determination of ages in calcite and opal fracture and cavity coatings in the EWCD. The main goal of a planned trip is to complete line surveys between the first and second bulkheads (approximately at Stations 17+00 to 22+00) prior to closing of that part of the tunnel for moisture-monitoring studies. Further trips will be scheduled to complete that surveying if necessary. Additional safety training (ladders and fall protection) will be required to complete the mineral surveys.

In work on deferred activities, compilation of data continued in support of validation of surficial carbonate sources. A data package entitled "Stable Carbon and Oxygen Isotope Analyses of Crater Flat Surface Deposits" was submitted for review at the end of November. Another data package, containing strontium-isotope data for the same set of surface samples from Crater Flat, is being compiled; that strontium package is expected to be submitted for checker review during the first week of December.

Development of a draft test plan for geochemical and physical characterization of ESF dust continued. That draft test plan was completed on November 23 and is being submitted to technical and QA review. Staff attended the national Geological Society of America annual meeting in Boston, November 3—7, where a paper entitled *Geochemically homogeneous tuffs host the potential nuclear waste repository, Yucca Mountain, Nevada* was presented by Z. Peterman. Those results, in part, arose from studies of water-rock interaction in engineered-barrier system materials.

Several aspects of work continued toward completion of the chlorine-36 validation. The draft test plan for that  $^{36}\text{Cl}$  validation was completed on November 23 and was submitted for QA and technical reviews on November 26. The Lawrence Livermore National Laboratory Center for Accelerator Mass Spectrometry (CAMS) has completed the first

batch of 21 samples supplied by the USGS Environmental Science Team. The leachates were processed at CAMS by means of adding an enriched isotope carrier and preparing the AgCl precipitate. The suite of samples contained a pair of duplicates, a leachate from the USGS reference sample, and a blank. Preliminary results for the  $^{36}\text{Cl}$  validation core samples, reported verbally by G. Nimz (CAMS), are in the range of  $200 \times 10^{-15}$  to  $500 \times 10^{-15}$  atoms of  $^{36}\text{Cl}$  per atom of chlorine. All of these samples are from the ESF area just north of the intersection with the Sundance fault, where previous analyses showed a well-defined  $^{36}\text{Cl}$  anomaly with values as large as  $4100 \times 10^{-15}$ . Duplicate splits of the leachates had also been sent to LANL, where AgCl precipitates were prepared and then submitted to CAMS for analyses. (As part of the validation effort, CAMS and LANL are employing different means of extraction of chlorine from the samples. Mass spectrometry for all current samples is being performed at CAMS.) Although a one-to-one sample comparison has not yet been made, preliminary results reported by R. Roback (LANL) indicate that the  $^{36}\text{Cl}$  values of the leachates processed at LANL are in the same range as those processed at CAMS. A second suite of leachates is expected to be analyzed during a run on November 30, and final results should be available by the middle of December. If no elevated  $^{36}\text{Cl}$  values are found in the second batch, a technical meeting among all participants and customers will assess the implications of these data and develop a path forward for interpretation of the  $^{36}\text{Cl}$  validation effort.

Tritium analyses and synthesis of tritium and U-series isotopic data will be delayed because of emphasis on acquisition of new  $^{36}\text{Cl}$  analyses and preparation of test plans.

Work on fluid-inclusion studies to interpret the thermal history of Yucca Mountain continued. An initial draft of the test plan for this work was prepared and submitted for review. Dating work continued: preparation of splits of fluorite separates already submitted for U-Th-He dating was begun for comparative U-Pb geochronology. Those studies should better define the cooling history of the UZ and how long the UZ has been at or near modern ambient conditions. A manuscript entitled *Physical and stable isotope evidence for formation of secondary calcite and silica in the unsaturated zone, Yucca Mountain, Nevada*, by J. Whelan, J. Paces, and Z. Peterman, was completed and received USGS Director's approval. That paper reports results of detailed studies of the history of secondary mineral formation in the Yucca Mountain UZ, provides a conceptual model of distribution of mineral deposition and precipitation predicated on separation of gases (especially through evaporation) from depositing fluids, and reevaluates the upwelling-hydrothermal versus downward-percolating water controversy in light of preliminary fluid-inclusion and thermal history data. The paper provides a paragenetic and mineralogic framework for a more detailed analysis of the fluid-inclusion and thermal history of the UZ to be prepared this fiscal year and reinforces the existing current conclusion that the upwelling-hydrothermal scenario is geologically and geochemically untenable.

## WATER-RESOURCES MONITORING

Work in water-resources investigations continued with routine on-going activities. Ground-water levels were measured at 34 sites, and ground-water discharge was measured at three springs and at one flowing well. Ground-water data collected during November were checked and filed. The draft Trend Analysis Report returned from supervisory review. Revisions in response to review comments are underway prior to submittal of the report for colleague review.

**USGS Milestone Report**  
**October 1, 2001 - November 30, 2001**  
Sorted by Baseline Date

**Level: 4**

| <b>Deliverable</b>   | <b>Due Date</b> | <b>Expected Date</b> | <b>Completed Date</b> |
|--|-----------------|----------------------|-----------------------|
| <b>SAGSZ905M4</b> Chemical/Petrographic Data to TDB/RPC          | 10/26/2001      | 12/31/2001           |                       |
| <b>SAGSM00M4</b> Review Draft: Aeromag Exp Basalt Volcanic       | 10/30/2001      | 12/31/2001           |                       |
| <b>SAGSW250M</b> Letter Report: 4th Qtr FY01                     | 10/31/2001      | 10/30/2001           | 10/30/2001            |
| <b>SAGSM38M4</b> First Draft Rpt on ATC Single-Hole Tracer Tstng | 11/1/2001       | 2/28/2002            |                       |
| <b>SAGSW910M</b> 3-D Fracture Depiction to TDB/RPC               | 11/15/2001      | 2/28/2002            |                       |
| <b>SAGSM900M</b> Water-Level AMR, Revision 1                     | 11/30/2001      | 12/31/2001           |                       |
| <b>SAGSZ900M4</b> Hydrochemistry Data Package to TDB/RPC         | 11/30/2001      | 11/29/2001           | 11/29/2001            |
| <b>SAGSZ910M4</b> ATC Isotope/Hydrochem Data to TDB/RPC          | 11/30/2001      | 11/29/2001           | 11/29/2001            |
| <b>SAGSZ920M4</b> Chem & Isotopic Anlys of Pore Water - TDB/RPC  | 11/30/2001      | 2/22/2002            |                       |

# YMP PLANNING AND CONTROL SYSTEM (PACS)

## MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey  
Date Prepared 12/13/2001 02:56 PM

Fiscal Month/Year November 30, 2000  
Page 1 of 1

| <u>CURRENT MONTH END</u> |                 |                      |                      |                         |                            |                  | <u>FISCAL YEAR</u> |                   |                      |
|--------------------------|-----------------|----------------------|----------------------|-------------------------|----------------------------|------------------|--------------------|-------------------|----------------------|
| WBS<br>ELEMENT           | ACTUAL<br>COSTS | PARTICIPANT<br>HOURS | SUBCONTRACT<br>HOURS | PURCHASE<br>COMMITMENTS | SUBCONTRACT<br>COMMITMENTS | ACCRUED<br>COSTS | APPROVED<br>BUDGET | APPROVED<br>FUNDS | CUMMULATIVE<br>COSTS |
| 1.2.21.5.T               | -1              | 0                    | 177                  | 0                       | 0                          | 0                | 140                | 0                 | 6                    |
| 1.2.22.1.3               | 11              | 110                  | 0                    | 0                       | 0                          | 0                | 20                 | 0                 | 22                   |
| 1.2.22.2.1               | 15              | 238                  | 0                    | 0                       | 4                          | 0                | 153                | 0                 | 21                   |
| 1.2.22.2.2               | 2               | -127                 | 0                    | 0                       | 0                          | 0                | 89                 | 0                 | 10                   |
| 1.2.22.4.6               | 46              | 588                  | 57                   | 0                       | 118                        | 0                | 539                | 0                 | 73                   |
| 1.2.22.4.D               | 16              | 240                  | 0                    | 0                       | 0                          | 0                | 190                | 0                 | 23                   |
| 1.2.22.4.E               | 23              | 250                  | 32                   | 0                       | 106                        | 0                | 361                | 0                 | 30                   |
| 1.2.22.4.I               | 25              | 369                  | 112                  | 0                       | 62                         | 0                | 214                | 0                 | 41                   |
| 1.2.22.4.S               | 81              | 1145                 | 221                  | 0                       | 121                        | 0                | 977                | 0                 | 152                  |
| 1.2.22.4.U               | 211             | 1442                 | 1390                 | 0                       | 739                        | 0                | 2739               | 0                 | 409                  |
| 1.2.22.6.2               | 13              | 214                  | 0                    | 0                       | 0                          | 0                | 118                | 0                 | 19                   |
| 1.2.22.6.3               | 195             | 1654                 | 2045                 | 0                       | 994                        | 0                | 2269               | 0                 | 347                  |
| 1.2.22.6.4               | 12              | 127                  | 183                  | 0                       | 146                        | 0                | 301                | 0                 | 43                   |
| 1.2.22.6.6               | 58              | 835                  | 0                    | 0                       | 0                          | 0                | 745                | 0                 | 96                   |
| 1.2.22.6.T               | 47              | -275                 | 0                    | 0                       | 0                          | 0                | 656                | 0                 | 128                  |
| 1.2.22.7.1               | 84              | 749                  | 656                  | 0                       | 249                        | 0                | 1568               | 0                 | 198                  |
|                          | 838             | 7559                 | 4873                 | 0                       | 2539                       | 0                | 11079              | 0                 | 1618                 |

U.S. GEOLOGICAL SURVEY  
ESTIMATED COSTS FOR October 1, 1999 - November 30, 2000  
12/7/2001 1:39:53 PM

|   | OCT<br>EST | NOV<br>EST | DEC<br>EST | JAN<br>EST | FEB<br>EST | MAR<br>EST | APR<br>EST | MAY<br>EST | JUN<br>EST | JUL<br>EST | AUG<br>EST | SEP<br>EST | TOTAL |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------|
| 4889-47011 Deferred - Surface Base Boreholes Close  | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 8191215TUM Deferred - Testing & Analysis            | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 12215T USGS Test Coord/Supp for Site Activ          | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 1.2.21.5.T  | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 1.2.21.5  | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 1.2.21  | 6.5        | -0.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 5.73  |
| 4889-59011 Support to Technical Update Document     | 10.8       | 11.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.09 |
| 81912213UA Support to Technical Update Docume       | 10.8       | 11.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.09 |
| 122213 Progress Reports                             | 10.8       | 11.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.09 |
| 1.2.22.1.3  | 10.8       | 11.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.09 |
| 1.2.22.1  | 10.8       | 11.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.09 |
| 4889-55011 Deterministic Seismic Hazards Analysis   | 6.7        | 14.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 21.32 |
| 81912221UA Science Support to Deterministic Seis    | 6.7        | 14.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 21.32 |
| 122221 Description of the Site for LA               | 6.7        | 14.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 21.32 |
| 1.2.22.2.1  | 6.7        | 14.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 21.32 |
| 4889-55021 Natural Analog Studies                   | 7.1        | 2.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.61  |
| 81912222UA USGS Support to Site Description         | 7.1        | 2.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.61  |
| 122222 Yucca Mountain Site Description              | 7.1        | 2.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.61  |
| 1.2.22.2.2  | 7.1        | 2.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.61  |
| 1.2.22.2  | 13.8       | 17.2       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 30.93 |
| 4889-56011 Nye County EWDP Borehole Lithostratigr   | 4.6        | 13.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 17.65 |
| 4889-56012 Hydrostratigraphic Cross Section, Nye Co | 5.9        | 5.6        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 11.51 |
| 81912246UA Lithostratigraphic Support to Nye Co.    | 10.5       | 18.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 29.16 |
| 4889-56021 Isotope/Hydrochemical Support to Nye Co  | 15.4       | 24.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.36 |
| 4889-56111 Deferred - Isotopic/Hydrochemical Suppor | 1.2        | 2.2        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.35  |
| 81912246UB Isotope/Hydrochemical Support to Ny      | 16.6       | 27.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 43.71 |
| 122246 Technical Support                            | 27.1       | 45.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 72.87 |

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|   | OCT<br>EST | NOV<br>EST | DEC<br>EST | JAN<br>EST | FEB<br>EST | MAR<br>EST | APR<br>EST | MAY<br>EST | JUN<br>EST | JUL<br>EST | AUG<br>EST | SEP<br>EST | TOTAL |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------|
| 1.2.22.4.6  | 27.1       | 45.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 72.87 |
| 4889-56031 Buried Basaltic Eruptive Centers           | 7.0        | 15.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.72 |
| 8191224DUA Science Support to Disruptive Events       | 7.0        | 15.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.72 |
| 12224D Disruptive Events Modeling Report              | 7.0        | 15.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.72 |
| 1.2.22.4.D  | 7.0        | 15.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.72 |
| 4889-56041 Geochem/Physical Characterization of ES    | 3.5        | 12.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 16.16 |
| 4889-56061 Deferred - Effects of Water-Rock Interacti | 0.0        | 4.3        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 4.27  |
| 8191224EUA Effects of Water-Rock Interaction on       | 3.5        | 16.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 20.43 |
| 4889-56051 Core Characterization Tstg - Thermal Con   | 3.2        | 1.7        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 4.86  |
| 4889-56052 Support to Soil Characterization Tests     | 0.0        | 0.9        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.86  |
| 4889-56062 Deferred - Thermal Conductivity            | 0.0        | 3.4        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.39  |
| 8191224EUB Nevada Operations Support to EBS           | 3.2        | 5.9        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.11  |
| 12224E EBS Dgrdtn Flow & Trnsprt PMR - LA             | 6.7        | 22.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 29.54 |
| 1.2.22.4.E  | 6.7        | 22.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 29.54 |
| 4889-56071 Map Proposed Repository Expansion          | 15.6       | 24.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.55 |
| 4889-56072 Support Review/Revision GFM AMR            | 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  |
| 8191224IUA Science Support to ISM PMR                 | 15.6       | 24.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.55 |
| 12224I Integrated Site Model PMR - LA                 | 15.6       | 24.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.55 |
| 1.2.22.4.I  | 15.6       | 24.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.55 |
| 4889-56081 Cross-Hole Hydraulic & Tracer Testing AT   | 41.1       | 35.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 76.97 |
| 4889-56082 Revise Site-Scale HFM                      | 5.9        | 3.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.43  |
| 4889-56113 Deferred - Water Level AMR                 | 5.7        | 3.4        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 9.08  |
| 8191224SUA SZ Investigations                          | 52.7       | 42.8       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 95.48 |
| 4889-56091 Isotopic/Hydrochemical Support to the AT   | 10.3       | 25.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 35.25 |
| 4889-56092 Hydrochronology of the Yucca Mountain F    | 5.3        | 10.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 15.36 |
| 4889-56112 Deferred - Monitor Isotopic/Hydrochemical  | 0.9        | 2.2        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.15  |
| 8191224SUB SZ Isotope Hydrology                       | 16.5       | 37.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 53.76 |
| 4889-56101 Liaison Support to Saturated Zone Studie   | 2.2        | 0.9        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.08  |



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|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| <b>8191224SUD</b> USGS Liaison to SZ Studies          | 2.2        | 0.9        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.08   |
| <b>12224S</b> SZ Flow & Trnsprt PMR - LA              | 71.4       | 80.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 152.32 |
| 1.2.22.4.S  | 71.4       | 80.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 152.32 |
| 4889-54011 Deferred - UZ Flow & Transport PMR - S     | 32.9       | 29.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 62.53  |
| 4889-56131 Alcove 8/Niche 3 Infiltration              | 12.9       | 12.5       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 25.43  |
| 4889-56132 Bulkhead Moisture Monitoring               | 26.6       | 30.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 56.68  |
| 4889-56133 Moisture Monitoring ESF & X-Drift          | 17.5       | 21.2       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 38.71  |
| 4889-56134 Support to UZ In-Situ Processes AMR        | 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   |
| <b>8191224UUA</b> UZ Moisture Studies                 | 90.0       | 93.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 183.34 |
| 4889-56141 U-Series Delineation of UZ Flow Zones      | 12.6       | 22.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 35.29  |
| 4889-56142 Fluid Inclusions & Thermal History of Yuc  | 18.6       | 29.5       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 48.08  |
| 4889-56143 Complete Chlorine 36 Validation            | 7.8        | 6.7        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 14.49  |
| 4889-56144 Chemical & Isotopic Composition of Pore    | 8.8        | 18.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 27.37  |
| 4889-56171 Deferred - Surficial Carbonate Source Vali | 1.5        | 1.7        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.18   |
| 4889-56172 Deferred - Pore Water Geochemistry         | 1.5        | 0.4        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 1.90   |
| 4889-56173 Deferred - Cl-36 Validation in the ESF     | 0.0        | 0.4        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.36   |
| 4889-56174 Deferred - Age Ca/Opal Frac/Cav Coating    | 4.1        | 6.5        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 10.60  |
| <b>8191224UUB</b> UZ Isotope Hydrology                | 54.8       | 86.5       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 141.26 |
| 4889-56151 Submission of Data from Alcove 8/Niche     | 2.9        | 0.8        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.70   |
| 4889-56152 Phase II Lithophysal Study (USBR)          | 40.2       | 7.8        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 47.99  |
| 4889-56175 Deferred - Supplemental Surface Fracture   | 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   |
| 4889-56176 Deferred - Lithophysal Study in the ECRB   | 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   |
| 4889-56177 Deferred - 3D Fracture Network Depiction   | 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   |
| <b>8191224UUC</b> Mapping (USBR)                      | 43.0       | 8.6        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 51.68  |
| 4889-56121 Isotope Support for Thermal Testing        | 7.6        | 16.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 23.99  |
| <b>8191224UUE</b> Drift-Scale Test ESF                | 7.6        | 16.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 23.99  |
| 4889-56161 USGS Liaison to Unsaturated Zone           | 2.6        | 6.1        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 8.64   |
| <b>8191224UUF</b> USGS Liaison to UZ Studies          | 2.6        | 6.1        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 8.64   |

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|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| 12224U UZ Flow & Trnsprt PMR - LA            | 198.0      | 210.9      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 408.91 |
| 1.2.22.4.U                                   | 198.0      | 210.9      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 408.91 |
| 1.2.22.4                                     | 325.8      | 401.1      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 726.90 |
| 889-57011 Federal Occupational Health/Safety | 6.4        | 12.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 19.06  |
| 81912262UB Environmental Safety & Health     | 6.4        | 12.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 19.06  |
| 889-57021 Deferred Funding - Water Resources | 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   |
| 81912262UQ Water Resources                   | 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   |
| 122262 Environment, Safety & Health Implem   | 6.4        | 12.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 19.06  |
| 1.2.22.6.2                                   | 6.4        | 12.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 19.06  |
| 889-57031 Technical Data Management          | 44.3       | 54.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 98.91  |
| 889-57032 Data Verification                  | 7.0        | 7.8        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 14.79  |
| 889-57033 USGS Publications Support          | 15.2       | 25.2       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 40.40  |
| 889-57034 QAIS Support                       | 20.5       | 19.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 39.68  |
| 889-57035 Data Checking                      | 6.6        | 5.9        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 12.58  |
| 81912263UA Technical Support                 | 93.6       | 112.7      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 206.37 |
| 889-57041 Computer/Network Support           | 23.1       | 28.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 51.68  |
| 81912263UB USGS Computer Support             | 23.1       | 28.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 51.68  |
| 889-57071 Records Support                    | 6.0        | 6.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 12.02  |
| 81912263UC Records                           | 6.0        | 6.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 12.02  |
| 889-57051 Regulatory Product Integrity       | 28.5       | 44.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 72.91  |
| 81912263UD Regulatory Product Integrity      | 28.5       | 44.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 72.91  |
| 889-57061 Closure of DR105                   | 0.0        | 3.6        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.58   |
| 889-57062 Closure of DR118                   | 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   |
| 81912263UE Closure of Deficiencies           | 0.0        | 3.6        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 3.58   |
| 122263 Technical & Regulatory Information M  | 151.2      | 195.4      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 346.56 |
| 1.2.22.6.3                                   | 151.2      | 195.4      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 346.56 |
| 889-57081 Program Planning & Performance     | 30.8       | 11.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 42.51  |

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|   | OCT<br>EST | NOV<br>EST | DEC<br>EST | JAN<br>EST | FEB<br>EST | MAR<br>EST | APR<br>EST | MAY<br>EST | JUN<br>EST | JUL<br>EST | AUG<br>EST | SEP<br>EST | TOTAL  |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| <b>81912264UB</b> Project Control                       | 30.8       | 11.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 42.51  |
| <b>122264</b> Baseline Control                          | 30.8       | 11.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 42.51  |
| 1.2.22.6.4  | 30.8       | 11.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 42.51  |
| 4889-57091 USGS Technical Project Officer               | 30.5       | 50.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 80.88  |
| 4889-57092 USGS Support to Chief Science Office         | 7.2        | 7.7        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 14.89  |
| <b>81912266UA</b> USGS Technical Project Officer        | 37.8       | 58.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 95.77  |
| <b>122266</b> Technical Management and Operatio         | 37.8       | 58.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 95.77  |
| 1.2.22.6.6  | 37.8       | 58.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 95.77  |
| 4889-57101 USGS Liaison to Testing                      | 2.6        | 5.8        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 8.40   |
| <b>8191226TUA</b> USGS Liaison to Testing               | 2.6        | 5.8        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 8.40   |
| 4889-57111 Shaft Design Support (USBR)                  | 15.2       | 2.4        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 17.60  |
| 4889-57112 Rock Mechanics Testing in the ECRB           | 24.4       | 17.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 41.53  |
| 4889-57113 Waste Handling Building Support              | 38.4       | 21.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 60.25  |
| <b>8191226TUB</b> USBR Testing Activities in Support of | 78.0       | 41.4       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 119.38 |
| <b>12226T</b> Testing and Monitoring Activities         | 80.5       | 47.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 127.77 |
| 1.2.22.6.T  | 80.5       | 47.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 127.77 |
| 1.2.22.6  | 306.6      | 325.0      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 631.67 |
| 4889-58011 Support & Personnel Services                 | 17.8       | 28.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 45.82  |
| 4889-58012 Procurement & Property Management            | 29.1       | 19.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 48.41  |
| 4889-58013 Facilities Management - Space                | 0.0        | 39.5       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 39.52  |
| 4889-58014 Facilities Management - Computers/Phon       | 0.0        | 0.3        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.28   |
| 4889-58015 Facilities Management - Other                | 58.5       | -35.9      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 22.60  |
| <b>81912271UA</b> Support & Personnel Services          | 105.3      | 51.3       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 156.64 |
| 4889-58021 Training Support                             | 9.1        | 32.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 41.64  |
| <b>81912271UC</b> Training                              | 9.1        | 32.6       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 41.64  |
| <b>122271</b> Administration                            | 114.4      | 83.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 198.28 |
| 1.2.22.7.1  | 114.4      | 83.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 198.28 |
| 1.2.22.7  | 114.4      | 83.9       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 198.28 |

U.S. GEOLOGICAL SURVEY  
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|                   | OCT<br>EST | NOV<br>EST | DEC<br>EST | JAN<br>EST | FEB<br>EST | MAR<br>EST | APR<br>EST | MAY<br>EST | JUN<br>EST | JUL<br>EST | AUG<br>EST | SEP<br>EST | TOTAL    |
|-------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|
| 1.2.22            | 771.4      | 838.5      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 1,609.87 |
| 1.2 OPERATING     | 777.9      | 837.7      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 1,615.60 |
| 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       | 777.9      | 837.7      | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 1,615.60 |
| FTEs              |            |            |            |            |            |            |            |            |            |            |            |            |          |
| FEDERAL           | 42.2       | 50.7       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |          |
| CONTRACT          | 35.6       | 31.2       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |          |
| TOTAL             | 77.7       | 82.0       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |          |