



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

Reply to:  
301 E. Stewart Ave., Rm. 203  
Las Vegas, NV 89101

Tel: (702) 388-6125  
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Date: April 1, 1992

TO: Charlotte Abrams, HLPD, M/S 4 H 3  
FROM: Paul T. Prestholt, On-Site Licensing Representative  
SUBJECT: SANDIA MONTHLY HIGHLIGHTS AND STATUS REPORT, FEBRUARY  
1992 and USGS YMP MONTHLY SUMMARY FOR FEBRUARY 1992 and  
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT  
PRELIMINARY FIELD COMPOSITE BOREHOLE LOG

Please find enclosed the above-referenced information.

PTP:nan

cc: Joe Holonich, w/o encs., M/S 4 H 3

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9204090301 920401  
PDR WASTE  
WM-11 PDR

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WM-11  
NH03



**Department of Energy**  
Yucca Mountain Site Characterization  
Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

*Crulatte*  
WBS 1.2.3.5  
QA: N/A

MAR 19 1992

Carl H. Johnson, State of Nevada, Carson City, NV  
Phillip Niedzielski-Eichner, Nye County, Chantilly, VA  
Dennis A. Bechtel, Clark County, Las Vegas, NV  
Albert C. Douglas, City of Las Vegas, Las Vegas, NV  
~~Richard Prestholm, NRC, Las Vegas, NV~~

**PRELIMINARY FIELD COMPOSITE BOREHOLE LOGS**

For your information, enclosed is a copy of the Preliminary Field Composite Borehole Log for borehole USW UZN-36 which was developed by the Drilling Support and Sample Management Department of Technical and Management Support Services. Drilling of the borehole was completed on March 4, 1992.

If you need additional information regarding the log, please contact Uel S. Clanton at (702) 794-7943.

RSED:USC-2427

*for*   
Carl P. Gertz  
Project Manager

Enclosure:  
Preliminary Field  
Composite Borehole Log

cc w/o encl:  
J. H. Peck, SAIC, Las Vegas, NV  
C. L. Lugo, SAIC, Las Vegas, NV  
P. E. Seidler, SAIC, Las Vegas, NV  
R. L. Bullock, RSN, Las Vegas, NV  
J. R. Dyer, YMP, NV  
A. C. Robison, YMP, NV

# YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT PRELIMINARY FIELD COMPOSITE BOREHOLE LOG

BORE HOLE ID: USW UZN-36

STUDY PLAN NO.: 8.3.1.2.2.1

CORE SIZE: HQ/2.25"

DRILL DATES: 2/28/92 - 3/4/92

GROUND ELEVATION: 4,650 MSL (est.)

GROUND COORDINATES: N 774,800 E 563,350 (est.)

TOTAL DEPTH: 59.8

ANGLE FROM VERT.: N/A

BEARING: N/A



ALLUVIUM



NON-WELDED



PARTIALLY WELDED



DENSELY WELDED



BEDDED TUFF



VITROPHYRE

LOG VERSION DATE

3/5/92

geology by Drilling Support Division, Drilling Support and Sample Management Dept., T&MSS

RUNS/DATES/ RECOVERY	CORE LOSS	DRILLING RATE (ft/hr) BIT RECORD		FRAC FREQ (X/5 FT)	DEPTH STRAT COL	LITHOLOGY/REMARKS		
		0	10	20			0	50
		2.0	7.0	12.0			5.0	10.0
DC 1								
1		5.4	6	Bit No. 1	N/A	0.0 - 0.9 Alluvium; dark yellow brown, poorly consolidated		
2		8		21		TOP OF TIVA CANYON @ 0.9		
2/28/92						0.9 - 16.4 Tuff, ashflow; grayish red, moderately welded; devitrified; 10-15% phenocrysts of sanidine and plagioclase with minor biotite; 5% lithophysal voids; calcite on open, irregular joints and fractures		
3		2.9				from 5.7 - 16.4, scattered open fractures, 3-10 mm apertures, with calcite and trace iron staining		
4		12.8		Bit No. 2	16			
5		3.3						
6		4.8			6.8			
7		6.0			9	16.4 - 31.5 Tuff, ashflow; pale reddish brown, moderately welded, devitrified; 5-10% phenocrysts of plagioclase and sanidine with minor biotite; matrix harder but with increased lithophysal voids		
8		7.5			10			
26.4/25.8 98%					7			
3/4/92		2.5						
9					30			

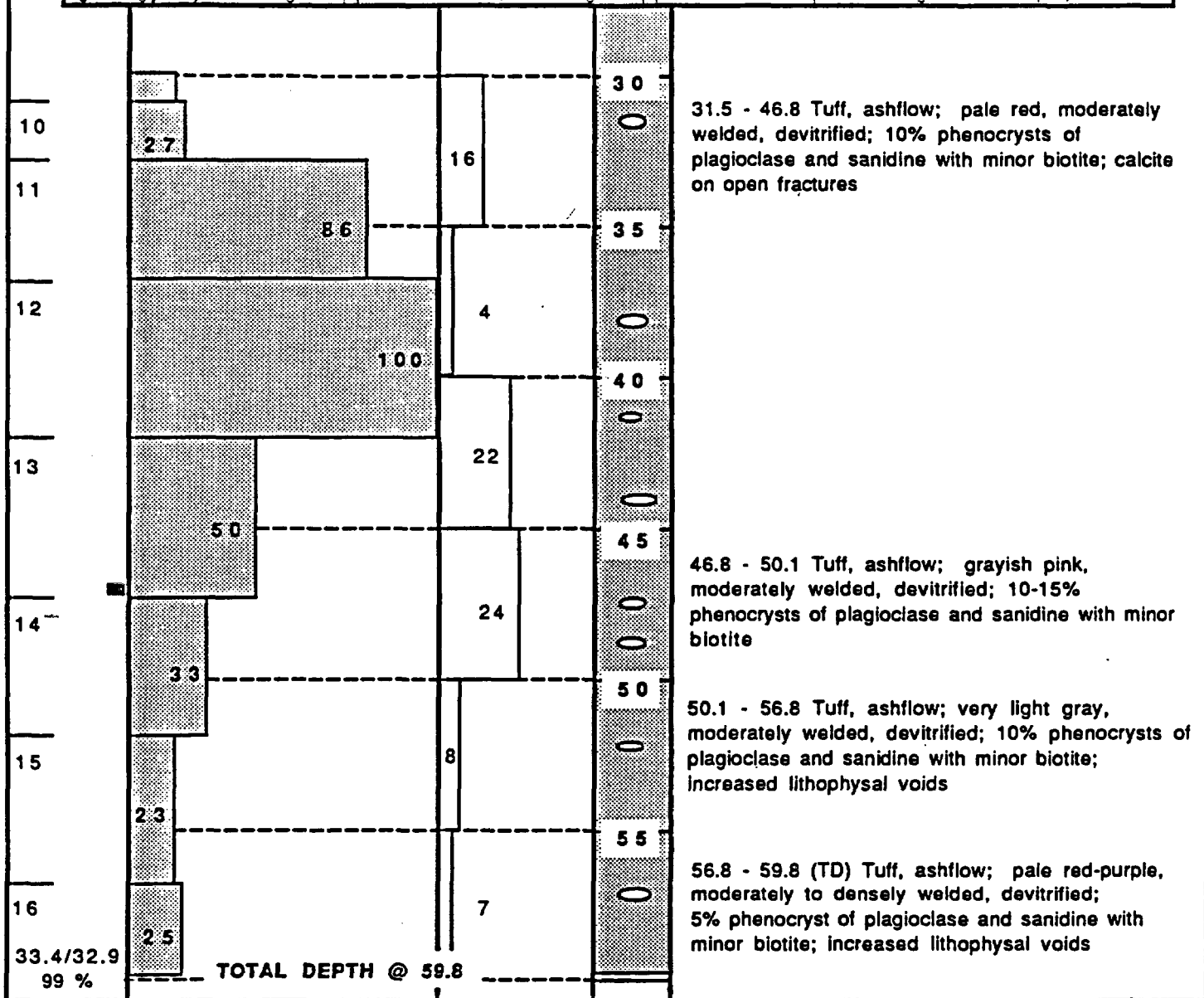
ENCLOSURE

**YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT  
PRELIMINARY FIELD COMPOSITE BOREHOLE LOG (cont.)**

USW UZN-36

pg 2 of 2

geology by Drilling Support Division, Drilling Support and Sample Management Dept., T&MSS



**BIT INFORMATION:**

Bit No. 1 Christensen: SN 2S-022901; 3.937" x 2.400"; 10 air courses 1/8" x 1/8"; diamonds - 9 stones per carat  
 Bit No. 2 Stratapak: SN 2S-022555; 15 cutters; 10 water courses 1/4" x 5/16"; diamonds - 20 stones per carat



United States Department of the Interior

I-325050

GEOLOGICAL SURVEY  
BOX 25046 M.S.  
DENVER FEDERAL CENTER  
DENVER, COLORADO 80225

IN REPLY REFER TO:

March 11, 1992

Carl P. Gertz, Project Manager  
Yucca Mountain Project Office  
U.S. Department of Energy  
P.O. Box 98608  
Las Vegas, Nevada 89193-8608

*Lois  
Dyer  
Simmons  
Simeola  
Dyer  
Bradley  
Jones  
Gertz / Johnson  
w/ { Blanchard }*

WBS: 1.2.9.2  
QA: N/A

*3/16/92*

SUBJECT: U.S. Geological Survey Yucca Mountain Project Monthly Summary for February 1992.

Dear Carl:

In compliance with the revised Yucca Mountain Project monthly reporting procedures, following is the YMP USGS input for February, 1992. If you have any questions, please contact Raye Ritchey at FTS 776-0517.

WBS 1.2.1 - SYSTEMS ENGINEERING

In support of the development and validation of flow and transport models, core samples from the Topopah Spring and Calico Hills units were analyzed to determine porosity, dry bulk density and particle density using Archimedes principle. The samples were dried in a relative humidity oven and are currently being run through a helium pycnometer to measure particle density using nonpolar gas displacement. An imbibition table was constructed and successful preliminary tests run using the core samples from the shardy base transect. Imbibition and porosity will be used as an indication of hydrologic alterations due to heating of the cores.

WBS 1.2.3 - SITE INVESTIGATIONS

In support of stratigraphic studies, the first suite of core samples from the high-silica rhyolite of the Topopah Spring Member of the Paintbrush Tuff was submitted for isotopic analysis. These samples will be used to determine the utility of the systematic variation in strontium isotopic composition as a potential stratigraphic indicator.

Staff from the geologic mapping of zonal features project proceeded with chemical separations for isotopic analysis of outcrop samples of volcanic rocks which, when compared with the core samples already analyzed, will be used to determine the extent of alteration of units below the Topopah Spring Member of the Paintbrush Tuff. Mapping and measurement of fault characterization parameters along the Ghost Dance fault on Yucca Mountain was begun. This work utilizes the rectilinear grid laid out last month, which will allow collection of numerous types of information on a consistent foundation grid. These efforts will characterize a large number of parameters along the fault which will be integrated into the geologic model.

In support of vertical seismic profiling activities, computer interpretational codes ANI90 and BEAM87 were exercised with data from drillhole USW G-4. Preliminary results of this testing with actual well log data from Yucca Mountain show that significant ray bending and focusing will occur in the top 200 to 300 m of the tuff section. This ray bending will produce a shadow zone from 200 to 400 m below the surface.

The precipitation and meteorological monitoring project reports that February was an abnormally wet month. A large area of low pressure developed off the coast of California on the 5th and moved onshore causing heavy precipitation throughout the southwest. Subsequent storms moved through the Yucca Mountain area on the 6th and 7th and the 9th through the 14th. The collection gage network received an areal average of over 3.4 inches, well ahead of "normal". Negligible lightning was observed during the February storms. None occurred near Yucca Mountain. Work will begin on analyzing lightning location and density as a function of precipitation catch at locations where lightning occurred near rain gage sites. Since only one thunderstorm occurred at Yucca Mountain during the 1991 "monsoon" season, precipitation data collected by the Nevada Test Site's climatological rain gage network will be used to perform the analysis. Storms on February 7 and 9 brought rain in lower elevations and snow above 6,000'. No runoff occurred. Storms on February 12-14 produced the first runoff, in several major tributaries on the Nevada Test Site and the Amargosa River, in nearly eight years. Data collection activities produced valued data for creation of discharge tables for streams, formerly nonexistent or based solely on theoretical tables. The data will allow a comparison to be made between discharge and rainfall. Greater accumulation was noted on the SW corner of Area 25, which includes Exile Hill, NF Coyote Wash, Yucca Wash, and Fortymile Wash at the narrows. Runoff was noted in the following areas of NTS: Fortymile Wash at UZN#91 below Pah Canyon; first unnamed left bank tributary to Fortymile Wash north of Delirium Canyon; first unnamed left bank tributary to Fortymile Wash south of Delirium Canyon; Delirium Canyon Tributary to Fortymile Wash; Fortymile Wash at the narrows; Yucca Wash near mouth, NTS; unnamed tributary to Fortymile Wash near Rattlesnake Ridge; Cane Springs Wash Tributary near Cane Springs; Topopah Wash at Little Skull Mountain, NTS; Dune Wash near mouth, NTS. Yucca Flat on the NTS once again was covered with

water - a rough estimate places 300 to 600 acre feet of water on the playa. Although stream flow was noted along major tributaries of Las Vegas Wash and along the Amargosa River between Tecopa and southern Death Valley, no evidence of heavy debris transport was noted.

In support of Fortymile Wash recharge studies, data were analyzed from rain gages, streamflow observations, neutron logging, and depth to groundwater in wells. The analysis indicated groundwater recharge occurred and is continuing to occur in lower Fortymile Canyon. Data collection frequency was increased to document the recharge event.

In support of studies to characterize hydrologic properties of surficial materials, an additional surface outcrop transect was conducted which collected samples at approximately 5 foot spacing starting in Yucca Wash and progressing upward to the Prow. The transect represents all units from the Calico Hills zeolitized to the Tiva Canyon caprock, which includes welded Yucca Mountain and Pah Canyon units from the Paintbrush Tuff which are not found in boreholes further south. This transect, and probably one to two additional transects, are intended to represent the spatial variability of the units and ascertain if the deterministic trends of the physical properties apparent in the previous transects hold true over the extent of the mountain.

Staff from the natural infiltration project continued analysis of moisture profiles for boreholes N-55 and N-54 located in WT-2 Wash, and for N-37 located in Wren Wash. Analysis of moisture profiles was initiated for the newly installed borehole N-11 located on Mile High Mesa. Results from a preliminary analysis of neutron logging data and core sample data from boreholes N-55, N-54 and N-37 will be used as a new test case for the validation of numerical models for unsaturated flow. Modelers will use all lab core analysis to predict neutron log moisture profiles under steady state conditions. Modeling results will be important in the verification of the conceptual model of both present day and historical natural infiltration. Analysis of neutron log profiles obtained for N-11 indicated a significant increase in moisture to a depth of approximately 10 feet caused by heavy precipitation during February of more than 3 inches on Mile High Mesa. Six boreholes in the channel of Pagany Wash (N-4, N-5, N-6, N-7, N-8, and N-9) were also logged with increased frequency following the precipitation events, and a comparison of the moisture profiles indicated a significant increase in moisture to a depth of approximately 1 meter. Boreholes N-91 and N-92 in the channel of Fortymile Canyon were logged at relatively frequent intervals of approximately 5 days immediately following the heavy precipitation events. Comparison of moisture profiles indicated significant infiltration into the alluvium to a depth of approximately 4 to 5 meters. Despite an incident involving the unwanted and unapproved application and subsequent removal of mulch surrounding boreholes N-54 and N-55

during the period of precipitation, an increase in moisture was observed in both boreholes to a depth of 1 meter following the precipitation events. No changes in moisture content were observed at greater depths in N-54 while slight changes were observed in N-55, possibly due to fracture flow. In general, the data obtained during and immediately after the period of precipitation in February will be very useful in defining upper boundary conditions, material properties, and stratigraphic layers for the deterministic modeling effort, as well as for a direct analysis of infiltration and redistribution caused by winter precipitation. A total of 12 new neutron access borehole sites were located and proposed for FY92. As of the end of February, the installation of 4 boreholes (N-55, N-54, N-37, N-11) was completed, and the installation of the 5th borehole (N-38) was approximately 50 percent complete. Locations for the next 3 boreholes (N-15, N-16, N-17) were modified slightly for compliance with environmental surface studies and have received verbal approval.

The matrix hydrologic properties testing project reports that over 100 additional transect samples were collected up the north face of Yucca Mountain to add to the 650+ already on hand. The new samples were taken to fill gaps in the data, and to supply a single line which crosses nearly all of the rock types in the unsaturated zone. From the transect samples taken on Yucca Mountain, 57 have been selected as representative of the various formations, members and microunits which comprise the unsaturated zone. Saturated hydraulic conductivity (single-phase water permeability) was measured on about half of these rocks in February using the high-flow permeameter.

In support of prototype infiltration testing, the first stage of the ponding test, started on October 28, 1991, continued. A second slug of 3 liters of water was added to the top of the block. The water front has moved about 40 to 45 cm in the fractures and 5 to 10 cm in the matrix surrounding the fracture. The water movement in the fractures is not as fast as originally expected. Seven out of the 18 thermocouple psychrometers are showing an increase in water potential (and saturation). The potential level is still detectable with psychrometers; therefore, this stage will continue longer than originally expected.

In support of prototype pore water extraction studies, several comparison tests for compression methods to extract water were run between nonwelded core samples and nonwelded rock chips from nearly the same interval. The chips had an average moisture content of 6.3 percent and produced an average of 1.4 mls of water and 119 mls of gas. The similar core averaged a moisture content of 6.4 percent and produced an average of 2.9 mls of water and 100 mls of gas.

In support of aqueous phase chemical investigations, 10 core specimens from UZ-4 and UZ-5 were distilled to obtain pore water,



which will be analyzed for tritium, deuterium, and oxygen-18. Percent CO<sub>2</sub> (carbon dioxide) concentration, part per million CH<sub>4</sub> (methane), and part per million SF<sub>6</sub> (sulphur hexafluoride) of pore gas from squeeze samples were determined on the gas chromatograph: from UZ-4 core, 56 samples; from UZ-5 core, 35 samples; from UZ-6s core, 11 samples.

The development of conceptual and numerical models of flow in unsaturated zone fractured rocks project reports that recent laboratory experiments conducted as part of the percolation test have investigated moisture conditions under which fractures become conductive to liquid water. These experiments have involved a 0.10 meter thick sand layer placed on top of an approximately 0.75 meter tall block of fractured, welded tuff. In these experiments, volumes of water sufficient to completely saturate the sand were added, and matric potentials within the sand and rock monitored during subsequent redistribution of moisture. Numerical experiments were performed using the flow simulator TOUGH in which the experimental conditions were reproduced, albeit in a highly idealized manner, in an attempt to determine the fracture characteristics that result in fractures becoming relatively nonconductive to water when matric potentials at the sand-rock interface became less than approximately -0.10 meters. Drainage of the sand appeared to cease at this value, resulting in a more or less time-invariant value of matric potential within the sand. Results of the sensitivity analysis are still being analyzed.

In support of the simulation of the natural hydrogeologic system, for development of the 3-D grid, the elevations at the central nodes of the horizontal grid were calculated for the various hydrogeological unit boundaries, the ground surface and the water table. Because of the thickness variations of the hydrogeological units, the units were subdivided into a number of sublayers of nonuniform thickness using a newly developed scheme. The three-dimensional grid has been developed for the 4 sub-areas of the site-scale model. Because the sub-layers could not be created uniformly over the entire model area, the discontinuities in the numbers of sub-layers between neighbor elements create some difficulties. Development of the 3-dimensional numerical grid is basically complete.

Staff from the multiple-well interference testing project completed review of the acoustic televiewer (AT) logs done in December 1991, determining orientation of fractures visible on logs of UE-25c#2 and UE-25c#3. Fracture data was tabulated for boreholes UE-25c#2 and UE-25c#3 from TV logs, 1984 AT logs, and the 1991 AT logs mentioned above. Hydrogeologic cross sections were prepared for the c-holes, integrating lithologic data, fracture data, tracejector survey data, and heat pulse survey data, to identify zones of hydrologic interest at the c-hole complex. This information is useful for cross-hole seismic test planning,

hydraulic stress test planning, and hydrogeologic modeling. Final testing and preparation for the cross-hole seismic field work have been carried out. This includes final modifications to the high voltage system to allow for increased duty cycles and power levels. A new component to the system was fabricated to allow "DC" operation up to 15 KV with arbitrary modulation of any waveform. The band width was increased to 10 Khz with this modification. High voltage cable leads were fabricated and a spare source was also built.

In support of regional paleoflood studies, preparation began of a longitudinal stream profile of the modern-day Amargosa River extending from Pahute Mesa (Fortymile Wash and tributaries) to Death Valley (Bad Water). The purpose of this profile is to show the slope of the different reaches of the channel and any breaks in slope due to resistant bedrock barriers. Later, this profile will be compared with similar profiles drawn on terraces to depict the paleo-floodplain of the river.

In support of past discharge studies, preliminary analyses of faunal samples from modern springs indicate that the material contains ostracodes at many sites which were also sampled for water quality. Coupling the water quality analyses with the occurrence of ostracodes will give the water quality parameters including water temperature for the ecological range of individual ostracode species. This data is then stored in the ostracode database and will be used for site characterization interpretations. Ostracodes were found in samples from wet and dry playas collected in FY 1991 from Jornada Lakes, Isaak Lake and Playas Lake, New Mexico. In California, ostracodes were found in samples from Dry Lake at 29 Palms Marine Corps Base, Hayfield Lake, Silver Dry Lake and East Cronese Lake, California. Ostracodes were found in FY 1992 sites at Coal Valley, Mud Lake, and Big Smoky Valley Playa in Nevada. Playas containing ostracodes immediately below the playa surface indicate that for at least part of the year these sites are fed by discharging ground water either from the discharge area of a deep aquifer or from a shallow flow system where the discharge area is the playa bottom. In the arid west, playas without ground-water discharges areas are generally dry.

Activities in support of future climate studies include: inputting faults into ROCKWARE's rose diagram packages preliminary figures were made that show distribution of fault orientations; inputting of stress field data - each of the structural zones will now be analyzed with relation to stress fields; labeling of digital files of Mariposa, Trona, Death Valley, and Kingman quads - Mariposa and Kingman quads were lumped into hydrogeologic units, joined, and the edges matched; editing of geologic cross sections for the 3-D model - cross sections were transferred to the Intergraph system and put into 3-D space.

WBS 1.2.5 - REGULATORY & INSTITUTIONAL

In support of water resources monitoring activities, water level measurements were made at 27 network sites. The increase in the number of sites measured is a result of those sites having access permits approved by DOE. The first report presenting data on ground-water levels and springflows in the Yucca Mountain Region was provided to DOE. Compilation of historical ground-water level and springflow data for monitoring sites was emphasized to aid in the identification of baseline conditions. The report contains data on 35 water level monitoring sites and 6 ground-water discharge sites for the period of record. Data compiled goes back to 1953 for water levels and to 1910 for spring discharges. A water level monitoring system was installed and calibrated to monitor water level changes in Well JF-3 prior to and during the pumping of the well, and for a limited time after testing.

Sincerely,

*Larry R. Hayes*

*for*  
Larry R. Hayes  
Technical Project Officer  
Yucca Mountain Project  
U.S. Geological Survey

cc: D. Appel, USGS/Denver  
J. Blakey, USGS/CR  
T. Blejwas, SNL/Albuquerque  
M. Brodeur, SAIC/Las Vegas  
R. Bullock, RSN/Las Vegas  
D. Campbell, USBR/Denver  
J. Canepa, LANL/Los Alamos  
T. Chaney, USGS/Denver  
T. Conomos, USGS/WR  
J. Cook, USGS/SR  
R. Craig, USGS/Las Vegas  
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D. Gillies, USGS/Denver  
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C. Johnson, TESS/Las Vegas  
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J. Sauer, USGS/NR  
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N. Trask, USGS/Reston  
B. Viani, LLNL/  
J. Weeks, USGS/Denver  
YMP-USGS Local Records Center File 1.1.02

*Charlotte*

**Sandia National Laboratories**

Albuquerque, New Mexico 87185

MAR 18 1992

WBS: 1.2.9

QA: NA

Carl P. Gertz, Project Manager  
Yucca Mountain Site Characterization  
Project Office  
U. S. Department of Energy  
Nevada Operations Office  
101 Convention Center Drive  
Phase 2, Suite 200  
Las Vegas, Nevada 89193-8518

Attention: V. F. Iorri

Dear Carl:

Subject: February 1992 Monthly Highlights and Status Report

Enclosed is the Monthly Highlights and Status Report for the month of February 1992. If you have any questions, please call Fran Cheek-Martin at FTS 844-7810.

Sincerely,

*Thomas E Blejwas*

Thomas E. Blejwas, Acting Manager  
Nuclear Waste Repository Technology  
Department 6310

FCM:6318:jd  
Enclosure