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Department of the Interior United States Geological Survey YUCCA MOUNTAIN PROJECT Monthly Highlights and Status Report September 1990

DISCLAIMER

Quality Assurance checks on data contained in this report have been performed only to determine that the data have been obtained and documented properly. Any information is preliminary and subject to change as further analyses are performed. This report has not been reviewed for conformity with U.S. Geological Survey technical and editorial standards and stratigraphic nomenclature. Company names are for descriptive purposes only and do not constitute endorsement by the U.S. Geological Survey.

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ACRONYM LIST

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A&E	architectural and engineering
ABC	American Borate Corporation
ACD	advanced conceptual design
ACM	alternative conceptual model
ACNW	Advisory Committee on Nuclear Waste
ACP	Area Characterization Plan
ACS	American Chemical Society
ACWP	actual cost of work performed
ADP	automated data processing
AEC	Atomic Energy Commission
AECB	Atomic Energy Control Board
AECL	Atomic Energy of Canada, Ltd.
AEG	Association of Engineering Geologists
AFOS	Automated Field Operating System
AFR	Audit Finding Report
AGU	American Geophysical Union
AIH	American Institute of Hydrology
ALARA	as low as reasonably possible
ALTS	Apache Leap Tuff Site
AMA	Assistant Manager for Administration
AMFM	alternative means of financing and managing
AMP	Administrative Management Procedure
ANS	American Nuclear Society
ANSI	American National Standards Institute
ΑΟ	Administrative Officer
AP	Administrative Procedure
APQ	Administrative Procedure Quality
ARR	Area Recommendation Report
ARS	Automated Records System
ASA	American Statistical Association
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASR	Annual Status Report
ASTM	American Soceity for Testing and Materials
ATC	Asynchronous Terminal Concentrator
ATLAS	Alternatives to License Application Strategies
ATS	Activity Tracking System
AVL	Approved Vendors List
BA	Biological Assessment
BAC	budgets at completion
BBC	British Broadcasting Company
BBS	Bulletin Board System
BCWP	budgeted cost for work performed
BCWS	budgeted cost for work scheduled
BDR	Basic Data Recorder
BFD	Basis for Design

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DOAT	
	Bond Gold and Hydrosearch
	Branch of Geologic Risk Assessment
DLM	Bureau of Land Management
	blacket such as a successful to the second s
DrA	blanket purchase agreement
DrU	Branch of Ougling Assurement
DUA	Branch of Quality Assurance
	Delow regulatory concern
DKG	Branch of Central Regional Geology
	Bi-annual Status Report
BWIP	Basalt waste Isolation Project
C/SCR	Cost and Schedule Change Report
	consultation and cooperation
CA	Construction Authorization
	Computer-Aided Dratting and Design
CAE	Computer-Aided Engineering
CAM	Cost Account Manager
CAP	cost account plan
CAR	Corrective Action Report
CASY	Committee for the Advancement of Science in the YMP
CATS	Corrective Action Tracking System
CBI	Controlled Blasting Investigation
	Change Control Board
	Configuration Control Committee
CD	Consultative Draft
CDP	Career Document Profile
CDR	Conceptual Design for the Repository
CFR	Code of Federal Regulations
ChemTrec	Chemical Transportation Emergency Center
CHLW	commercial high-level waste
CIRF	Configuration Identification Request Form
CMR	Branch of Central Mineral Resources
СОВ	close of business
	Computer-Oriented Geological Society
	conditional simulation
CPR	Cost Performance Report
CR	Central Region
CRF	Central Records Facility
CRF	Comment Response Form
CRG	Central Regional Geology
CRGB	Central Regional Geology Branch
CRW	comment resolution workshop
CSCS	Cost Schedule Control System
CSM	Colorado School of Mines
Сү	calendar year
D&E	development and evaluation
DAA	Design Acceptability Analysis
DAS	data acquisition system
DCP	data collection platform
DDP	Director's Decision Plan
DEC	Digital Equipment Corporation
DEIS	Draft Environmental Impact Statement

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•	ĩ '	DEC	Denver Federal Center
		DHLW	defense high-level waste
•		DISA	Downhole Instrument Station Apparatus
		DOE	Department of Energy
		DOE/HQ	Department of Energy Headquarters
		DOE/NV	Department of Energy/Nevada Operations Office
		DOE/NVO	Department of Energy/Nevada Operations Office
		DOP	Department Operating Procedures
		DOT	Department of Transportation
		DR3M	Distributed Routing Rainfall-Runoff Model
			Desert Research Institute
			Data Records Management System
			document review sneet
		DTP	Detailed Test Plan
	:	DWMD	Defense Waste Management Department (REECo)
		DWPF	Defense Waste Processing Facility
		EA	Environmental Assessment
		EAC	estimate at completion
		EAEG	Eurocan Association of Exploration Geophysicists
		EBS	engineered barrier system
		ECR	Engineering Change Report
		EDBH	engineered design borehole
		EDF	Environmental Defense Fund
		EEI	Edison Electric Institute
		EEP	Emergency Evaluation Plan
			Environmental Field Assessment Plan
			Emergency Information Administration
		EIS	Electonic Keved-Entry System
		EM	electromagnetic
		ЕМР	electron-microprobe
		EPA	Environmental Protection Agency
		EPRI	Electric Power Research Institute
		ERDA	Energy Research and Development Administration
		EROS	Earth Resource Observatory System
		ERTP	Environment Requirements Training Program
		ES	exploratory shaft
		ESF	Exploratory Shaft Facility
		ESQAT	Earth Science Quality Assurance Team
		ESK	Electron spin resonance
		ESTC	Exploratory Shaft Test Plan
		ESTP.C	Exploratory Shaft Test Plan Committee
		EV	earned value
		FEHMS	Finite Element Heat Mass and Stress
		FEIS	Final Environmental Impact Statement
		FEMA	Federal Emergency Management Agency
		FFS	Federal Financial System
		FFS	Federal financial system
		FID	Flame Ionization Detector
		FIS	Federal interim storage
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FITS	Facilities Important to Safety
FMMG	Fracture Matrix Mesh Generator
FP	final procedures
FPC	final procurement and construction
FQI	Federal Quality Institute
FR	Federal Register
FRD	Functional Requirement Document
FRHP	Fractured Rock Hydrology Program
FSN	Fenix and Scisson, Nevada
FSU	Florida State University
FTE	full-time equivalent
FWP	field work proposal
FY	fiscal year
G&A	Goodson and Associates
GAO	Government Accounting Office
CCM	Global Climata Model
CCP	Crockernele ried Presedure
GCF	Geological Procedure
GD	Geologic Division
GEOEAS	Geostatisical Environmental Soltware
GETT	grants equal to taxes
GID	Ground Water Site Investigation
GIS	Graphic Information System
GOCO	government-owned contractor-operated
GOES	Geostatisical Environmental Operational Satellite
GP	Geologic Procedure
GPO	Government Printing Office
GPP	Geophysical Procedure
GPR	ground-penetrating radar
GPS	global positioning satellite
GQA	Graded Quality Assurance
GRESS	Gradient Enhanced Software System
GSA	Geological Society of America
GSA	General Services Administration
GSIS	Geoscientific Information System
GTUF	G-Tunnel Underground Facility
GW	ground water
GWE	Gigawatts Electrical
GXP	Geochemical Procedure
H&N	Holmes and Narver
HLRW	high-level radioactive waste
HIW	high-level waste
НР	Hewlett Packard
	Hydrologic Procedure
	Hadmater
пу	Hudrologie Decesseb Engility
	Hydrologic Research Facility
	Hydrological Simulation Program
	rivurokogical Simulation Program
10M	International Dusiness Machines
	International Geologic Congress
IUN	Interim Change Notice
IFS	Iterated Function Systems
IGT	Institute of Gas Technology

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ICWG	Interface Control Working Group
IDAS	Integrated Data Acquisition System
IDS	Information Data System
IFS	Iterated Function System
IG	Integration Group
IGT	Institute of Gas Technology
IHLWM	International High Level Radioactive Waste Management
IMS	Information Management System
INEL	Idaho National Engineering Laboratory
INSTAAR	Institute of Arctic and Alpine Research
IR	infrared
IRG	Interagency Review Group
ISA	Instrument Society of America
ISA	Information Systems Division
ISO	International Standards Organization
IVV	Independent Verification and Validation
	Independent Vernication and Vandation
JOK	Journal of Geologic Research
LA	license application
	laser angument and centering target
	local area network
LANL	Los Alamos National Laboratory
	Lawrence Berkeley Laboratories
	Liquid Scintillation Counter
LDRP	litigation discovery request procedure
LLNL	Lawrence Livermore National Laboratory
LLP	Lightning Location & Protection, Inc.
LLW	low-level waste
LOE	level of effort
LRC	Local Records Center
LRE	latest revised estimate
LRP	long-range planning
LRS	Litton Resource System
LSP	laser safety plan
LSS	Licensing Support System
LWS	Lathrop Wells aeromagnetic survey
LV	Las Vegas
MADS	Meteorological Alert Distribution System
MCL	Maximum Contaminant Level
MEDA	Meteorological Data Acquisition Network
MGDS	Mined Geologic Disposal System
MIC	Management Information Center
MISIS	Micro Integrated Storm Information System
МТ	materials testing laboratory
MMDS	Martin Marietta Data Surtems
MOT	Management Aversien Team
ΜΟΠ	Memorandum of Understanding
MDRA	multinurnoce horehole activity
	multinumose borehole activity
	Management Proceeding Marvel
	Management Procedure Manual
	Manuscript Prep Unit
MKIK	Material Receiving and Inspection Report
MRS	monitored retrievable storage

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MSA	major system acquisition
MSHA	Mine Safety and Health Administration
MSL	mean sea level
MT	magneto-telluric
M&TE	measuring and test equipment
MTU	metric tons of uranium
MW	mixed waste
NARUC	National Association of Regulatory Utility Commissioners
NBS	National Bureau of Standards (now NIST)
NCAR	National Center for Atmospheric Research
NCR	Nonconformance Report
NEA	Nuclear Energy Agency
NEPA	National Environmental Policy Act
NFS	Nuclear Fuel Services
NHP	Nuclear Hydrology Program
NIST	National Institute of Standards and Technology
NMD	National Mapping Division
NMIMT	New Mexico Institute of Mining and Technology
NNWSI	Nevada Nuclear Waste Storage Investigation
NOAA	National Oceanic and Atmospheric Administration
NOO	Nevada Operations Office
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRP	National Research Program
NSTF	near-surface test facility
NTC	National Training Center
NTS	Nevada Test Site
NTSO	Nevada Test Site Office
NVO	Nevada Operations Office
NWF	Nuclear Waste Fund
NWIS	Nevada Water Information System
NWIS	National Water Information System
NWM	Nuclear Waste Management
NWN	Nuclear Waste News
NWPA	Nuclear Waste Policy Act
NWPO	Nuclear Waste Projects Office
NWOL	National Water Quality Laboratory
NWTRB	Nuclear Waste Technical Review Board
OBS	organization breakdown structure
OCRWM	Office of Civilian Radioactive Waste Management
OF	Open file
OFR	open-file report
OGR	Office of Geologic Repositories
OMB	Office of Management and Budget
OMR	Office of Mineral Resources
OPFM	Office of Project and Facilities Management
OPIO	Office of Policy Integration and Outreach
ORM	Office of Resource Management
ORNI	Oak Ridge National Laboratory
OSTS	Office of Storage and Transportation Systems
P&S	nlanning and scheduling
Σα	paning and substants

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,	PAC	planning and control
	PACS	Planning and Control System
	РАСЕОРН	. Pure and Applied Geophysics
	PAGIS	Performance Assessment of Geological Isolation Systems
•	PAL	Project Acronym List
		Performance Assessment Management Plan
		Performance Assessment Strategy Plan
	PRFI	nrototype blast effects on instrumentation
	PBO&D	Parson, Brinkerhoff, Ouade, and Douglas
	PBS	, pyramid beam splitter
	PC	personal computer
	РСВІ	Prototype Controlled Blasting Investigation
	РССВ	Program Change Control Board
	PCM	pivoting camera mount
	PCSB	Program Cost and Schedule Baseline
	PC&TS	Program Coordination and Technical Support
		prototype any coming of rubble
		Problem Definition Memorandum
	PDS	Project Decisions Schedule
	PEET	prototype excavation effects test
	PI	Principal Investigator
	PIP	. Prototype Investigation Plan
	PIR	. Precision Infrared Radiometer
	PL	. Public Law
	PMF	. probable maximum flood
	PMIS	Program Management Information System
	PMP	Program Management review
	PMR	Program Management System
	PNI.	Pacific Northwest Laboratories
	PPWE	, prototype pore-water extraction
÷	PQM	. Project Quality Management
	PRBP	. project review briefing package
	PRC	. Project Records Center
	PRDA	. Program Research and Development Announcement
	PRESS	Project-related Engineering and Scientific Studies
	PRMS	Preliminary Safety Analyzic Report
	PSAK	nounds per square inch
	РТР	Prototype Test Plan
,	PTS	. Petroleum Testing Services
	QA/QC	. quality assurance/quality control
	QA	. Quality Assurance
	QALA	. Quality Assurance Level Assignment
	QALAS	. Quality Assurance Level Assignment Sheet
	QAM	. Quality Assurance Manager
	QAPO	. Quality Assurance Project Officer
	QAP	Quality Assurance Program
	QAPP	Onality Assignment Records
	VAR	. Anami washing was
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QASC	Quality Assurance Support Contractor
QMP	Quality Management Procedure
QMPR	Quality Management Policies and Requirements
QRA	Quality Related Activities
QVC	Quality Verification Check
QWL	quality of work life
R&D	research and development
R&H	receiving and handling
R&LSD	Research and Laboratory Services Division
RALD	right angle laser deflectometer
RAM	responsibility assignment matrix
ΡΑζΑ	Regional Aquifer Study Assessment
ΡΑςΡΑ	radial arm strike rail assembly
ערטער	Parional Characterization Deport
	Regional Characterization report
NCRA	Resource Conservation and Recovery Act
RED3	Radiation Energy Datance Systems
	Reynolds Engineering and Electrical Company
Krr	Request for Proposal
RIB	Reference Information Base
RIS	Records Information System
RMF	Records Management Facility
RMNMD	Rocky Mountain National Mapping Division
RMP	Records Management Plan
RMS	Records Management System
ROD	Record of Decision
RPC	Report Package Collection
RQPG	right angle prism goniometer
RRL	reference repository location
RTISA	request to initiate site activity
RW	radioactive waste
RWMS	Radioactive Waste Management Site
s-p	surface-propagated
SA	study activities
SAGEEP	Symposium on the Application of Geophysics to
	Engineering and Environmental Problems
SAIC	Science Applications International Corporation
SAR	Safety Analysis Report
SAS	Statistical Analysis System
SBTFRD	Surface-Based Test Facility Requirements Document
SBTP	Surface-Based Test Prioritization
SCA	Site Characterization Analysis
SCC	substantially complete containment
SCI	Software Configuration Items
SCIF	software checklist and indexing form
SCM	Software Configuration Management System
SCP	Site Characterization Plan
SDR	Standard Deficiency Report
SDR	Subsystems Design Requirement Document
SEND	Senior Engineer
оц	Surtame Engineering and Development
SECU	systems Engineering and Development
	Statining Ciccifon microscopy
3EWL	system engineering management rian

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CEDRD	Site and Engineering Properties Base Data
SEI DD	Scientific and Engineering Software
SES	spent fuel
SC	Senior Geologist
SCP	Southern Great Basin
SCIDEN	Southern Great Basin Seismic Network
	Seismic Group Recorders
	Scientific Investigation Plan
	Scientific Investigations and Research
SIR	Special Investigations and Rescarch
SIR	Site Integration Team
SII	Suc Integration Team
SKB	Swedish Nuclear Fuel and Waste Wanagement Company
SMF	Sample Management Faculty
SNF	spent nuclear luci
SNL	Sandia National Laboratorics
SNP	Scientific Notebook Plan
SNSN	Southern Nevada Seismic Network
SOBART	Southern Basin and Range Transects
SOC	Sample Overview Committee
SOIR	status of open items report
SOP	Standard Operating Procedure
SP	Seismic Procedure
SP	Study Plan
SPA	Study Plan Assessment
SPE	Society of Petroleum Engineers
SPOC	submersible pressurized outflow cells
SPR	Semi-annual Progress Report
SOA	Software Quality Assurance
SOAP	Software Quality Assurance Plan
SRD	system requirements and description
SRG	strike rail goniometer
SRP	Site Recommendation Report
SSF	software summary forms
SSF	specified software forms
SSR	Site Selection Report
SSR	Soil Science Society of America
SWO	stop-work order
\$7	saturated zone
TEMSS	Technical and Management Support Services
1011133	Technical Assessment Review
	to be determined
TDM	Tunnel Boring Method
	Technical Contact
	Training Coordinator
	teleconing comera nedestal
	Thermocouple Psychrometer Calibration
TUPAL	Technical Data Advisory Group
TDAG	Tect Descriptions Document
TDD	test definition form
TDF	. LASK UCHIIIIIOII IOIIII
TDR	tetel discound colids
TDS	, IOIAI alsolved solids
TEF	. Test and Evaluation raciity

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TIC	Technical Information Contac
	Technical Information Center
1M	inematic mapper
TP	Technical Procedure
ТРО	Technical Project Officer
TQM	Total Quality Management
TRIG	Technical Review and Integration Group
TRIMS	Technical and Regulatory Information Management
	System
TRU	Transuranic
TVA	Tennessee Valley Authority
line	Linderground Nuclear Evalosion
LINE V	University of Neveda at Las Vegas
	University of Nevada at Las Vegas
	University of Nevada, Keno
Urs	Uninterrupted Power Supply
URL	underground research laboratory
USBR	U.S. Department of the Interior Bureau of Reclamation
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Trans Mercator
UZ	unsaturated zone
UZFRHP	Unsaturated Zone Fractured Rock Hydrology Project
UZIG	Unsaturated Zone Interest Group
UZSBP	Unsaturated Zone Surface-Based Borehole Project
VAR	Variance Analysis Report
VIF	very low frequency
VOC	Validation Oversight Committee
VOG	Validation Oversight Group
VCD	valuation Oversight Oroup
VSI	Western Atlan
WA	Weste Acceptance Criteria
WAC	Wash Authorization Submission
WAS	work Authorization Submission
	Work Dreakdown Structure
WIPP	waste isolation Pilot Plant
WIT	Working Integration Team
WMSD	Waste Management Systems Description
WNRE	Whiteshell Nuclear Research Establishment
WP	waste package
WRD	Water Resources Division
WRI	Water Resources Investigations
WRIR	Water Resources Investigations Report
WRR	Water Resources Research
WSNSO	Weather Service Nuclear Support Office
WSP	Water Supply Paper
WT	water table
WVDP	West Valley Demonstration Project
YM	Yucca Mountain
YMP	Yucca Mountain Project
УМРВ	Yucca Mountain Project Branch
YMPO	Yucca Mountain Project Office

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OBJECTIVE

To characterize Yucca Mountain and vicinity to identify and technically qualify a possible site for the construction and operation of a mined geologic repository for high-level radioactive waste.

> WBS 1.2.3.1 Management and Integration Principal Investigator - L. Hayes

OBJECTIVE

To manage and integrate the work performed within the site WBS elements.

ACTIVITIES AND ACCOMPLISHMENTS

R. Craig participated in the ESF Alternatives Study as member of the Expert Panel on Testing/Site Characterization. Meetings were held on September 4-6 for training and familiarization with the 34 ESF-options; on September 19-21 for activities preliminary to establishing probabilities related to the 34 ESF-options and the possibilities of false positives and false negatives (site is not okay, but testing indicates that it is, and site is okay, but testing indicates that it is not, respectively); and on September 24-27 for training on estimating and establishing probabilities for the 34 ESF-options.

Technical Activities

T. Lippert attended the September 7th open TPO meeting as acting USBR Technical Program Officer and the National Resources Council symposium on Radioactive Waste Repository Licensing, September 17 and 18.

The abstract, "Close-Range Geophotogrammetric Mapping of Trench Walls using Multi-Model Stereo Restitution Software," by J. Coe, E. Taylor, and S. Schilling for submittal to the American Society of Photogrammetry and Remote Sensing Meeting to be held in Baltimore, Maryland, March 1991, was approved by DOE September 24.

A photograph of the south wall of Trench 14 was submitted to DOE on September 18 for approval to submit the photo to the Journal of Photogrammetric Engineering and Remote Sensing as a possible cover photograph.

The following Technical Procedures were edited and returned to NHP as requested:

HP-86, R1	Method for Degassing CO ₂ and H ₂ O Vapor Samples from Unsaturated Zone Test Holes
HP-131, R2	Methods for Handling and Transporting Unsaturated Core and Rubble Samples for Hydrochemical Analysis
HP-171, R1	Low Tension Vadose Moisture Sampling
HP-192, R1	Shallow Soil Gas Collection
HP-202, R0	Method for Analysis of Water Samples for Selected Anion Concentrations by Ion Chromatography
HP-207, R0	Operation of the G.E.R. Model II Iris Spectroradiometer
HP-200, R0	Collection of Ground-Water Samples from Wells

The following technical procedures were approved:

HP-75, R1	Method for Measuring Water Levels in Wells Using Reeled (2600-foot and
	2800-foot) Steel Tapes
HP-186, R1	Methods for Locating Field Sites on Topographic Maps for Reconnaissance

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	and Site Characterization Activities
HP-208T, R0	Field Verification of Surficial Material Properties from Remote Sensing
	Analysis Techniques (new procedure)
GCP-09, R1	Preparation of Spike Solutions

The following Geologic Division technical procedures or scientific notebook plans have been prepared per the author's instructions and returned to the author for further input:

GCP-02, R2	Labeling, Identification, and Control of Samples for Geochemistry and Isotope
	Geology
GCP-13, R2	U-Th-Pb Isotope Geochemistry
GCP-24T, R0	Modifications to U-Th-Pb Isotope Geochemistry Procedures
GP-27, R2	Trench Wall and Natural Outcrop Sampling for Coordinated Studies
SP-13, R0	VSP and Crosshole Tomographic Surveys

Procedure GP-13, R1, "Fracture Logging from Acoustic Televiewer Images," is ready for Technical Review.

A letter with an accompanying prepared map was sent to A. Buono to assist T. Bray in gaining access authorization to do geodetic leveling work at Yucca Mountain and vicinity this fall.

Status tracking continues on the pipette analysis being conducted by A. Onions (USGS, Vancouver, Washington) in response to USGS AFR-EA-9001-01. Status tracking on the progress of work done in response to USGS-NCR-89-29 was completed.

The Geologic Division Menlo Park offices were visited as part of a transition of QA Implementation Specialists.

A meeting was organized for the TPO, Geologic Division Management, and the QA Office to make a final determination on the exclusion of Paleomagnetic Studies in the verification activity (VA) for CAR-90-01. An amended response to CAR-90-01 was issued. This action results from a preliminary investigation into the Verification of Scientific Investigation 8.3.1.8.5.1.2, Geochronology Studies. The VA Plan for 8.3.1.8.5.1.2 was prepared and the activity was coordinated to completion.

The Geologic Division was assisted with ongoing corrective actions for: SDR-489, EA90-01, R1, CAR-89-04, CAR-89-10, NCR-89-29, NCR-90-30, and NCR-90-34.

The YMP-USGS Training Coordinator and Document Control were notified to inactivate the status and decontrol documents of M. Diggles, D. Milton, and B. Turrin.

A determination was made that a verification activity as outlined in QMP-3.10, Verification of Scientific Investigations, was not needed when a change of Principal Investigator for WBS 1.2.3.2.8.4.1 took place. A verification waiver was prepared and submitted to the QA Office.

An investigation into Backlog Records was conducted at Lawrence Berkeley Laboratories who was found to have approximately 18 inches of back log paper records.

A Draft of QMP-3.03, R3, was distributed to 17 GD PIs and Technical Contacts in Menlo Park and Denver for an informal review. Meetings were held with J. Stuckless, J. Whelan, J. Gomberg, M. Meremonte, W. Smith, and D. Plouff to receive informal review comments which are being compiled for the SQA Committee.

SASRs, R2 were completed for: SEISMIC, LDMUX, LPTPLOT, PING, and SQUASH and submitted to the SCM Librarian.

Potential reviewers for the Seismic Data Acquisition Package's Software Technical Review were contacted per K. Shedlock's memo of August 14. S. Kubichek and D. Harvey (University of Colorado, Boulder) have agreed to be reviewers.

Planning Documents

Seven expanded summary packages were submitted by J. LaMonaca to the High Level Radioactive Waste Management Conference for consideration. The conference is to be held April 28 through May 3, 1991, in Las Vegas, Nevada.

The NHP review was completed by T. Brady for (a) abstract, "Correlation of Integral Analysis of South" Twin River Stream Flow, Central Nevada, Preliminary Applications in Chaos Theory," by C. Savard; (b) report, "Developing Regional Ground Water Models for the Potential High-Level Nuclear Waste Repository at Yucca Mountain, Nevada," by K. Kolm, J. Downey, A. Turner, and E. Gutentag; (c) report, "Observations on Gas Composition and Flow at Open boreholes on the Coast of Yucca Mountain," by D. Thorstenson, E. Weeks, H. Haas, and J. Woodward; (d) report, "Yucca Mountain as a Repository - Neither Myth nor Millennium" by I. Winograd; (e) report, "Potential Applications of Three-Dimensional Geoscientific Mapping and Modeling Systems to the Yucca Mountain Project," by A. Turner and J. Downey; (f) report, "Origin of Ground Water in the Yucca Mountain Area, Nevada an Analog Study," by P. McKinley; (g) report, "A Three-Dimensional Approach for Simulating Regional Ground Water Flow Systems in the Yucca Mountain Area," by J. Downey, K. Kolm and E. Gutentag; (h) report, "Prototype Testing of Instruments for Monitoring Water and Tracer Movement in the Proposed Exploratory Shaft Percolation Test at Yucca Mountain," by J. Marvil, S. Doty, E. Kwicklis, F. Thamir, and C. Boughton; (i) report, "Seismic Cross-Borehole Imaging of the Near-Surface using Tomography and Prestock Migration in Elastic Physical Models," by A. Balch, H. Chang, G. Hofland, K. Ranzinger and W. Schneider, Jr.; and (j) report, "Combined Analytical/Numerical Approaches to Solving Fluid-Flow Problems in the Unsaturated Zone at Yucca Mountain," by R. Zimmerman, G. Bodvarsson and E. Kwicklis.

The following study plans were submitted to YMPO for review and approval: Study Plan 8.3.1.2.2.8 "Fluid-Flow in Unsaturated, Fractured Rock," by C. Boughton; Study Plan 8.3.1.2.3.3 "Site Saturated-Zone Hydrologic System Synthesis and Modeling," by E. Ervin and R. Luckey; Study Plan 8.3.1.5.2.1, R1, "Characterization of the Yucca Mountain Quaternary Regional Hydrology," by J. Stuckless and P. Glancy; the final NHP version of Study Plan 8.3.1.2.1.3 "Characterization of the Regional Ground Water Flow System," by J. Czarnecki; and the final NHP version of Study Plan 8.3.1.2.2.1 "Characterization of the Unsaturated-Zone Infiltration," by A. Flint. The NHP review of Study Plans 8.3.1.2.2.1, 8.3.1.5.2.1, R1, 8.3.1.2.1.3, and 8.3.1.2.2.1 was completed by T. Brady.

Study Plan 8.3.1.2.2.7 "Hydrochemical Characterization of the Unsaturated Zone," by A. Yang and Study Plan 8.3.1.16.1.1 "Characterization of Flood Potential and Debris Hazards of the Yucca Mountain Site," by P. Glancy and D. Meyer received OCRWM approval.

The Comment Resolution Workshop for Study Plan 8.3.1.2.2.1 "Characterization of the Unsaturated-Zone Infiltration," by A. Flint was conducted September 11 and 12, 1990, in Las Vegas with NHP participation by A. Flint, L. Flint, J. Weaver (SAIC/Golden) and W. Causseaux.

Ouality Assurance

The Study Plan record packages for SP 8.3.1.2.2.8, "Fluid-Flow in Unsaturated Fractured Rock" by C. Boughton and SP 8.3.1.2.3.3, "Site Saturated Zone Hydrology Synthesis and Modeling" by E. Ervin and R. Luckey were submitted to the LRC by J. LaMonaca.

The NHP Management Review for QMP 3.07, R4 - YMP-USGS Review Procedure, was completed by J. LaMonaca, T. Brady and W. Causseaux.

A total of 31 Technical Procedures and 2 Scientific Notebook Plans were in various stages of processing by NHP at the end of the month.

The Technical Procedures HP-115, R1, "Determination of Peak Spring Flow Discharge Using Pulverts," HP-131, R2, "Methods for Handling and Transporting Unsaturated Core Rubble Samples for Hydrochemical Analysis," HP-160, R1, "Methods for Collection and Analysis of Samples for Gas Composition by Gas Chromatography," and HP-194, R0, "Method for Determination of Percent Relative Humidity at Various Depths within Unsaturated Zone Test Holes" were approved.

J. Woolverton and P. McKinley discussed recertification of Li-Cor Inc. as a USGS-YMP approved vendor for calibration services.

J. Woolverton represented NHP as an interface between audit team personnel and NHP staff members in USGS-YMP internal audit 90-13.

J. Woolverton and W. Causseaux represented NHP as an interface between surveillance personnel and NHP staff members in the DOE surveillance of the USGS.

J. Woolverton, W. Causseaux and S. Frans represented NHP at the YMP-USGS weekly open items meetings during September 1990.

Approximately 110 SQA documents were received and/or processed during September. Fifty-one CCC Reviews were conducted and documented. The Configuration Status Log, Directory of Users, and SQA document tracking database have been updated as required.

A CCC meeting was organized and attended on September 10 and 11 in Menlo Park, CA. Agenda and minutes were prepared and distributed.

Continued improvements to the SCM document tracking database were put into place this month. A system has been developed that provides tracking of document requirements as well as documents received. This database system tracks software products and SQA documents independently. It provides greater latitude in SCM report generation and includes an on-demand SCM System status report. These features are necessary to provide information to the SCM Librarian for the organization and preparation agenda of CCC meetings. Such features are also necessary to provide information to the CCC members in order that they may conduct SCM Status reviews. Future improvements should include automated Technical Contact and User Notification production, inquiry capabilities for non-SCM users, and direct interface with the LRC records database for the submittal of baselined documents without duplicated data input.

The Technical Procedure Master List was updated and forwarded to the YMP-USGS QA Office as scheduled.

Calibration data entry was performed and appropriate monthly calibration reports were distributed.

Operations

T. Lippert continued coordination of hydrologic testing activities; compiled USBR weekly status reports; and coordinated preparation of USBR activities for the August Monthly Report.

V. Glanzman met with B. Hersh on September 17 to discuss data submittals to the SEPDB and

provided magnetic tapes of gravity and earthquake data from three open-file reports. The tapes are for transmittal to SNL to allow them to download the data tables contained in the open-file reports to avoid retyping and proofreading the information.

Problem: The continued delay in DOE approval of manuscripts for publications remains a problem. Five open-file reports submitted to DOE in December 1989 still have not been approved.

The Open Items Committee headed by the QA Advisor to the TPO addressed actions for open items involving USGS activities as follows:

DOE/YMP SDRs: monitoring commitments for SDR 489 (calibration requirements in technical procedures), preparation of additional information or amended responses for SDR 416 (LRC reviews of records) and SDRs 554 - 561 from DOE Audit 90-03 (USGS QA Program), coordination with DOE/YMP in successful closure of SDRs 488 (procurement), 553 (criteria letters) and 528 through 531 (software QA);

USGS CARs: amending the response for USGS CAR-90-01 (interface controls and agreements), assisting in the initiation and response to CAR-90-02 (failed transducers), discussing issues related to CAR-90-03 (overdue QA record package submittals), CAR-90-04 (trend indicating late corrective actions and/or responses), and CAR-90-05 (implementing instructions for LRC operations);

USGS TREND ANALYSIS: responding to the results from the Trend Analysis Report for August concerning late responses to open items and untimely completion of corrective actions;

USGS AUDITs and/or SURVEILLANCES: assigning response-input actions for draft Audit USGS-90-13 Findings and Observations (internal programmatic audit), continuing actions for AFR-9002-04 (supplier submittals of calibration documentation); and

USGS NCRs: notification of completion of Records Coordinator actions for USGS-NCR-89-16 (records management procedure), updating the status of actions for NCR-90-13 and 90-16 (records management problems, completing the actions for NCR-90-28 (criteria letter processing), amending the response for NCR-90-31 (distribution of procurement documents); and discussing actions for NCR-90-34 (contract by-passing QA review).

Coordination continued with the NHP and Geologic Division QA Implementation Specialists to develop appropriate management agreements with other USGS organizations or other organizations, such as LBL, LANL, etc., that will meet the requirements of AP-5.19Q or USGS-QMP-4.02. An agreement was completed for SCP activity 8.3.1.5.1.2 to exchange information between the USGS and LANL.

The following Technical Procedures and Scientific Notebook Plans were distributed:

GCP-09, R1	Preparation of Spike Solutions
HP-75, R1	Method for Measuring Water Levels in Wells Using Reeled (2,600-foot and 2.800-foot) steel tapes
HP-115, R1	Determination of Peak Streamflow Discharge Using Culverts
HP-160, R1	Methods for Analysis of Samples for Gas Composition by Gas Chromatography
HP-186, R1	Methods for Locating Field Sites on Topographic Maps for Reconnaissance and Site Characterization Activities
HP-194, R0	Calculation of Relative Humidity at Depths Within Unsaturated Zone Test Holes Using a Silica-Gel Tower

HP-208T, RO Field Verification of Surficial Material Properties from Remote Sensing Analysis Techniques

Procedure GCP-20, R0, "K-Ca Isotope Geochemistry" was rescinded.

QMP-5.01, R4, "Preparation of Technical Procedures" and QMP-17.01, R4, "YMP-USGS Records Management" were distributed.

Numerous routine document control functions were performed including distributing replacement documents. Follow-up DTNs were sent and completed DTN record packages were transmitted to the YMP-USGS Local Records Center.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.2 Geology Principal Investigator - R. Raup

OBJECTIVE

To conduct geologic investigations to evaluate the suitability of the surface and subsurface environment for siting a nuclear waste repository.

WBS 1.2.3.2.2 Rock Characteristics

OBJECTIVE

To describe present and expected rock characteristics of the Yucca Mountain site and to develop a threedimensional model of rock characteristics. (SCP Section 8.3.1.4)

WBS 1.2.3.2.2.1 Geologic Framework of the Yucca Mountain Site

OBJECTIVE

To conduct field studies, including surface and subsurface geophysical surveys and geologic mapping on the surface and in the exploratory shaft facility to characterize the geologic framework of the Yucca Mountain site. (SCP Investigation 8.3.1.4.2)

WBS 1.2.3.2.2.1.1 Vertical and Lateral Distribution of Stratigraphic Units within the Site Area Principal Investigator - R. Spengler

OBJECTIVE

To determine the vertical and lateral variability and emplacement history of stratigraphic units and lithostratigraphic subunits within the Yucca Mountain site area. (SCP Study 8.3.1.4.2.1)

SCP 8.3.1.4.2.1.1 Surface and subsurface stratigraphic studies of the host rock and surrounding units

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

R. Snyder completed and submitted the PACS forms for this activity to W. Langer and completed and submitted the Semi-annual Yucca Mountain Project "Technical Status Report" for the April-September 1990 period to G. Shideler.

Planning Documents

Ouality Assurance

Operations

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

SCP 8.3.1.4.2.1.2 Surface-based geophysical surveys

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

In addition to 13 reports worked on at various stages of publication, H. Oliver prepared 25 color viewgraphs and presented these new data to the National Academy Committee on Hydrologic Models on July 28, 1990, including color copies to the 15 member committee. Oliver also represented YMP geophysical studies at the Swedish-U.S. exchange meetings in Stockholm and Aspo on August 14 through September 2, 1990, where he gave a 2-hour lecture summarizing the major geophysical results of the YMP.

Planning Documents

Ouality Assurance

Operations

<u>Changes in Future Plans</u> (Plans <u>not</u> described in Work Plan)

WBS 1.2.3.2.2.1.2 Structural Features within the Site Area

Principal Investigator - R. Spengler

OBJECTIVE

To determine the frequency, distribution, characteristics, and relative chronology of structural features within the Yucca Mountain site area. (SCP Study 8.3.1.4.2.2)

SCP 8.3.1.4.2.2.1 Geologic mapping of zonal features in the Paintbrush Tuff

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

R. Spengler visited and assessed the geologic setting at the site of the Swedish Hard Rock Laboratory on the island of Aspo during the second technical exchange on stratigraphy, structure, and neotectonic. The focus of the meeting was geophysical characterization of site structural and lithologic features.

R. Spengler participated in CASY symposium "Fractures, Hydrology, and Yucca Mountain" held in Denver on September 13 and 14, 1990.

Planning Documents

Quality Assurance

Operations

R. Spengler submitted work plan descriptions, milestone charts, and resource information for the PACS

exercises.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

SCP 8.3.1.4.2.2.2 Surface-fracture network studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

C. Throckmorton and R. Verbeek attended a CASY-sponsored symposium "Fractures, Hydrology, and Yucca Mountain" held on September 13 and 14, 1990, in Denver, Colorado. Verbeek gave an oral presentation on statistical properties of real fracture networks and submitted an abstract by Verbeek and M. Grout titled, "Some general properties of joints and joint networks in horizontally layered sedimentary and volcanic rocks" -- an overview to be published in the USGS Open-file series.

C. Throckmorton prepared the Semi-annual YMP Technical Status Report (TSR) for Surface-fracture network studies (Activity 8.3.1.4.2.2.2) and attended a one-week training session/field trip on fracture studies from outcrops in Moab, Utah.

A manuscript submitted for inclusion in a USGS Bulletin by C. Throckmorton titled, "Mapping linear features at Yucca Mountain from large-scale aerial photographs: Methods and results", was approved by the auditor, (W. Wilson).

Planning Documents

Quality Assurance

Operations

Problems: The assignment of additional personnel (currently only one person is funded) would significantly speed progress on this activity.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.4.2.2.3 Borehole evaluation of faults and fractures

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

R. Snyder (a) attended the CASY Symposium "Fractures, Hydrology, and Yucca Mountain" and copresented a poster on Fracture Counts From Borehole Logs; (b) completed and submitted the Semiannual Yucca Mountain Project Technical Status Report for this activity for the April-September 1990 period to G. Shideler; (c) continued checking previous data of fractures logged from Televiewer logs, some of which is being revised; and (d) completed tally of types of fracture coatings from core reports for boreholes USW G-2 and USW G3/GU-3.

Planning Documents

C. Throckmorton and R. Snyder responded to reviewer's comments on Study Plan Activity 8.3.1.4.2.2.3, "Borehole Evaluation of Faults and Fractures" and submitted it to R. Spengler for additional responses.

Quality Assurance

<u>Operations</u>

R. Snyder completed and submitted the PACS forms for this activity to W. Langer.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.4.2.2.4 Geologic mapping of the exploratory shaft and drifts

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

M. McKeown and S. Beason attended the USGS CASY symposium on fractures.

M. McKeown provided a brief summary of the status of drill/blast and machine excavation methods to R. Spengler (USGS) along with copies of pertinent correspondence.

M. McKeown and S. Beason continued investigating downhole cameras for preliminary geologic mapping of machine bored shafts. Communications and meetings continued with R. Oliver (LANL). Cost estimates and a proposal are being developed.

Planning Documents

M. McKeown and S. Beason continued participation in the Sandia Alternatives Committee meetings for evaluating ESF layout options September 4 and 5 and September 24-26.

Ouality Assurance

J. Montgomery continued QA documentation of the analytical plotter software, ORIPROGRAM.

Operations

Prototype underground geologic mapping testing at the Fran Ridge Test Pits is still on hold because of the lack of an air quality permit and funds. An alternate site has been located and a cost estimate for excavation has been prepared. Funds have been allocated to excavate the pit at the alternate location.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.4.2.2.5 Seismic tomography/vertical seismic profiling

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

The paper entitled, "Seismic Imaging for Fracture Characterization and Structural Definition," by E. Majer, J. Peterson, T. Daley, K. Karasaki, and T. McEvilly was presented at the USGS/CASY meeting in Denver.

E. Majer participated in the seismic reflection peer review held in Las Vegas from September 10-12.

Work continued on ANRAY90 to improve the two point ray tracer and verify the cubic spline fitting routine.

Planning Documents

Comments from the DOE review of Activity 8.3.1.4.2.2.5 Study Plan were received and responses to the comments were prepared.

Quality Assurance

T. Mendez-Vigo (SAIC/Golden) visited LBL in order to take an inventory of documents to be

considered for duplication.

QA reading assignments were completed by various personnel.

Operations

<u>Changes in Future Plans</u> (Plans not described in Work Plan) Work is proceeding using a reduced work scope, because LBL funding is lower than anticipated.

WBS 1,2.3.2.8 Preclosure Tectonics

OBJECTIVE

To develop an understanding of and to characterize the tectonic events and processes that could impact proposed repository structures, systems, or components considered to be important to safety through the operational phase and that could affect the design and operation of certain structures, systems, and components required for exercising the retrieval option. (SCP Section 8.3.1.17)

WBS 1.2.3.2.8.3 Vibratory Ground Motion

OBJECTIVE

To develop a seismic-design basis for repository facilities that are important to safety; and to provide other information that will facilitate the assessment of the adequacy of the seismic-design basis and the identification release of radioactive materials. (SCP Investigation 8.3.1.17.3)

WBS 1.2.3.2.8.3.1 Relevant Earthquake Sources Principal Investigator - K. Shedlock

OBJECTIVE

To identify and characterize those earthquake sources that are relevant to a deterministic seismic hazard analysis of the site and, if active, could cause severe ground shaking at the site. (SCP 8.3.17.3.1)

SCP 8.3.1.17.3.1.2 Characterize 10.000-year cumulative slip earthquakes for relevant seismogenic sources

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> The Study Plan was submitted to the DOE.

Quality Assurance

Operations

WBS 1.2.3.2.8.3.3 Ground Motion from Regional Earthquakes and Underground Nuclear Explosions Principal Investigator - K. Shedlock

OBJECTIVE

To select or develop ground-motion models that are appropriate for estimating ground motion at the site from earthquakes and UNEs that will be used to determine the relevancy of seismic sources to a deterministic seismic hazard analysis, identify controlling seismic events, constrain simulated ground motions from controlling seismic events and estimate the probabilities of exceeding given ground-motion levels at the site. (SCP Study 8.3.1.17.3.3)

SCP 8.3.1.17.3.3.1 Select or develop empirical models for earthquake ground motions

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> Work on the Study Plan continued.

Ouality Assurance

Operations

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.2.8.3.4 Effects of Local Site Geology on Surface and Subsurface Motions Principal Investigator - K. Shedlock

OBJECTIVE

To determine and model site and systematic effects on surface and subsurface ground motions resulting from the local site geology. (SCP Study 8.3.1.17.3.4)

SCP 8.3.1.17.3.4.2 Model site effects using the wave properties of the local geology

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> The Study Plan was submitted to the DOE.

Ouality Assurance

Operations

WBS 1.2.3.2.8.3.5 Ground Motion at the Site from Controlling Seismic Events Principal Investigator - K. Shedlock

OBJECTIVE

To identify the controlling seismic events and to characterize the resulting controlling ground motions. (SCP Study 8.3.1.17.3.5)

SCP 8.3.1.17.3.5.1 Identify controlling seismic events

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> Work on the Study Plan progressed.

Quality Assurance

Operations

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.2.8.3.6 Probabilistic Seismic Hazards Analyses Principal Investigator - K. Shedlock

OBJECTIVE

To quantify the probability for experimenting ground motions of varying degrees of severity that might result from earthquakes of varying magnitude and distance from the site. (SCP Study 8.3.1.17.3.6)

SCP 8.3.1.17.3.6.1 Evaluate earthquake sources

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> Work on the Study Plan progressed.

Quality Assurance

Operations

WBS 1.2.3.2.8.4 Preclosure Tectonics Data Collection and Analysis

OBJECTIVE

To provide data and analyses required by other investigations including the assessments of fault displacement and vibratory ground motion that could affect repository design or performance. (SCP Investigation 8.3.1.17.4)

WBS 1,2.3.2.8.4.1 Historical and Current Seismicity

Principal Investigator - K. Shedlock

OBJECTIVE

To compile information on reported and instrumentally recorded earthquakes that characterize the earthquake potential near Yucca Mountain and to attempt to purge explosion and triggered earthquakes related to weapons testing from existing catalogs of instrumentally determined earthquakes. (SCP Study 8.3.1.17.4.1)

SCP 8.3.1.17.4.1.1 Compile historical earthquake record

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> The Study Plan is in internal review.

Ouality Assurance

Operations

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.17.4.1.2 Monitor current seismicity

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Sixteen portable seismographs were received and acceptance testing began.

The operation of the Southern Great Basin Seismographic Network continued.

Planning Documents

<u>Ouality Assurance</u> Work on software development and software QA continued.

Operations

The planning for the network upgrade continued.

Problem: FY89 capital equipment procurements are proceeding; FY90 money is now available, thus the FY90 procurements are proceeding.

WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain Principal Investigator - K. Fox, Jr.

OBJECTIVE

To identify Quaternary faults within 100 km of Yucca Mountain and to characterize those faults capable of future earthquakes with magnitude such that associated ground shaking could impact design or affect performance of the waste facility. (SCP Study 8.3.1.17.4.3)

SCP 8.3.1.17.4.3.1 Conduct and evaluate deep geophysical surveys in an east-west transect crossing the Furnace Creek fault zone, Yucca Mountain, and the Walker Lane

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

September 11 and 12, T. Brocher participated in a Peer Review Panel of the seismic reflection method for Yucca Mountain work. The meeting, held in Las Vegas, required extensive preparation of illustrations, a poster, and two talks totalling more than 2 hours in length.

T. Brocher participated in the poster session of the CASY meeting on Fractures, Hydrology, and Yucca Mountain, held in Denver, September 13 and 14. In W. Mooney's absence, Brocher presented Mooney's poster. Brocher's poster was entitled "Mapping the base of the Tertiary basin fill aquifer using the seismic reflection method."

Progress continued on the paper for external publication describing the geological interpretation of line AV-1, entitled, "Seismic reflection evidence for Tertiary detachment faulting in the eastern Amargosa Desert, Basin and Range Province, USA."

Problem: No response yet from DOE on a manuscript submitted to them in December for approval, regarding the comparison of explosive and Vibroseis methods for seismic reflection profiling of the lower crust near Yucca Mountain.

D. Klein worked on preparation of the Semi-annual Technical Status Report for this activity.

Planning Documents

Quality Assurance

D. Klein worked on the preparation of software documentation and associated revision of technical procedure for Milestone Report (1986 magnetotelluric data).

Operations

T. Brocher completed a long description of his project activities for the Semi-annual TSR in preparation by G. Shideler.

WBS 1.2.3.2.8.4.6 Ouaternary Faulting within the Site Area

Principal Investigator - J. Whitney

OBJECTIVE

To evaluate the age and recurrence interval of Quaternary faulting and to analyze the probability of future faulting; to determine which faults moved during the Quaternary; and to assess fault probability on the basis of rates of faulting during the Quaternary. (SCP Study 8.3.1.17.4.6)

SCP 8.3.1.17.4.6.1 Evaluate Quaternary geology and potential Quaternary faults at Yucca Mountain

ACTIVITIES AND ACCOMPLISHMENTS

<u>Technical Activities</u>

D. Muhs and B. Szabo both reviewed papers on U-series dating of impure carbonates for the journal Geochimica et Cosmochimica Acta. One of these papers included data from the Yucca Mountain area (Crater Flat area).

D. Muhs gave a presentation on the origin of secondary carbonates in the Yucca Mountain area at a GD-WRD-NMD USGS workshop on surficial geologic processes at Big Meadows, Shenandoah National Park, Virginia, on September 19, 1990.

D. Muhs attended a CASY meeting on September 12 and attended the CASY symposium on fractures at Yucca Mountain on September 13, 1990. Muhs also organized the next CASY symposium to be held on October 10, 1990. The title of the symposium is "Isotope geology, hydrochemistry, and geochemistry in characterization studies of Yucca Mountain" and will include seven speakers, from both the GD and WRD.

B. Szabo continued U-series analyses of travertine samples collected in the Spring Mountains by I. Winograd.

G. Cebula and J. Groen continued mineral separations and purification of carbonate samples collected by D. Muhs and J. Whitney for eventual U-series dating by Muhs. The samples are from both the Yucca Mountain area and the Amargosa Desert.

Planning Documents

Quality Assurance

D. Muhs, C. Bush, and B. Szabo all received reading assignments during the month.

C. Bush spent part of the month reviewing QMP 3.03, R3.

Operations

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C. Bush continued setting up the new computer system to be used for data collection, processing and printout of alpha spectrometric U-series data.

WBS 1.2.3.2.8.4.7 Subsurface Geometry and Concealed Extensions of Quaternary Faults

Principal Investigator - W. Mooney

OBJECTIVE

To provide data on distribution of mass, magnetic gradients, geoelectric features, and seismic velocities and reflections that will aid in evaluating the continuity and geometry of Quaternary faults where concealed by Holocene and late Pleistocene surficial deposits. (SCP Study 8.3.1.17.4.7)

<u>SCP 8.3.1.17.4.7.1</u> Evaluate intermediate depth (2 to 3 km) reflection and refraction methods and plan potential application of these methods within the site area

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

September 11 and 12, T. Brocher participated in a Peer Review Panel of the seismic reflection method for Yucca Mountain work. The meeting, held in Las Vegas, required extensive preparation of illustrations, a poster, and two talks totalling more than 2 hours in length.

T. Brocher participated in the poster session of the CASY meeting on Fractures, Hydrology, and Yucca Mountain, held in Denver, September 13 and 14. In W. Mooney's absence, Brocher presented Mooney's poster. Brocher's poster was entitled "Mapping the base of the Tertiary basin fill aquifer using the seismic reflection method."

Progress continued on the paper for external publication describing the geological interpretation of line AV-1, entitled, "Seismic reflection evidence for Tertiary detachment faulting in the eastern Amargosa Desert, Basin and Range Province, USA."

Problem: No response yet from DOE on a manuscript submitted to them in December for approval, regarding the comparison of explosive and Vibroseis methods for seismic reflection profiling of the lower crust near Yucca Mountain.

Continued writing report - this activity will spill into FY91 because of reduced funding and other commitments.

Preparation was made for the October meeting on drilling near Yucca Mountain.

Milestone M396 (Interpretive Report) is approximately 75% complete and milestone B606 (Data Report) approximately 15% complete.

Planning Documents

Ouality Assurance

Operations

T. Brocher completed a long description of his project activities for the Semi-annual TSR in preparation by G. Shideler.

<u>SCP 8.3.1.17.4.7.5</u> Evaluate surface geoelectric methods and plan potential application of these methods within the site area

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Work continued to prepare the maps (1:12,000, 1:24,000, 1:100,000) and some composite cross-sections showing different electrical surveys on Yucca Mountain. These will be incorporated in a report on the status and potential of electrical surveys at Yucca Mountain. Most of this month was spent overseeing drafting of the maps. Work was done on the Semi-annual Technical Status Report and the paper by D. Klein and Hardin, "Relationships Between Geology and Electric Surveys..." for the Bulletin on Yucca Mountain was reviewed and revised.

Planning Documents

Ouality Assurance

Operations

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.2.8.4.8 Stress Field within and Proximal to the Site Area Principal Investigator - H. Swolfs

OBJECTIVE

To provide data on the ambient stress at the site and its immediate vicinity and to evaluate to potential relevance of paleostress data to prediction of future stress orientations. (SCP Study 8.3.1.17.4.8)

<u>SCP 8.3.1.17.4.8.2</u> Evaluate and test shallow borehole hydrofrac and triaxial strain-recovery methods for the determination of in situ stress, and if appropriate, plan potential application of these methods within and proximal to the site

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

<u>Planning Documents</u> Work on the Study Plan progressed.

Ouality Assurance

Operations

WBS 1.2.3.3 Hydrology Principal Investigator - D. Gillies

OBJECTIVE

To conduct hydrologic investigations to evaluate the suitability of the surface and subsurface environment for siting a nuclear waste repository.

WBS 1.2.3.3.1 Geohydrology

OBJECTIVE

To provide information about geohydrologic characteristics, processes, and conditions, both favorable and potentially adverse, to support resolution of the performance and design issues through the development of a credible geohydrologic model of Yucca Mountain and vicinity. (SCP Section 8.3.1.2)

WBS 1.2.3.3.1.1 Description of the Regional Hydrologic System

OBJECTIVE

To develop a conceptual model of the regional hydrologic system to assist in assessing the site's suitability to contain and isolate waste. (SCP Investigation 8.3.1.2.1)

WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology

Principal Investigator - A. Flint

OBJECTIVE

To characterize the area surrounding Yucca Mountain in terms of precipitation and other meteorological data and their relationship to surface runoff and infiltration; and to provide input into rainfall-runoff model development for the Fortymile Wash drainage basin. (SCP Study 8.3.1.2.1.1)

SCP 8.3.1.2.1.1.1 Precipitation and meteorological monitoring

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

A weak trough of low pressure aloft developed over the U.S. west coast about mid-month and deepened sharply by the 18th. An upper-level low pressure center developed over the Nevada-Idaho border. At lower levels the humidity began to increase so that by the 17th enough moisture was available to produce thunderstorms which were being triggered by the trough aloft. In the afternoon of the 18th, thunderstorms developed east of the Nevada Test Site with little storm activity directly on the test site. No storms affected the Yucca Mountain region until Friday, the 21st. A brief shower passed over the Hydrological Research Facility and between the HRF and Yucca Mountain. The HRF recorded .03 inches from this shower. Then, on Sunday the 23rd, storms moved over the region dumping an average of .38 inches on and around Yucca Mountain. The greatest amount fell in Upper Fortymile Wash - .92 inches. The low pressure center began drifting northward from its southern most position over San Diego to a point over San Francisco by the 25th. This weather pattern is more typical of winter than of the summer monsoon.

An initial analysis of the August 15th precipitation event was completed for the network of rain gages.

Geostatistical analyses of 1988 total precipitation data for southern Nevada and southeastern California were completed. Data from about 70 stations were analyzed for total seasonal precipitation and data from about 50 stations were used for a seasonal analysis. An analysis of monthly precipitation distribution is presently being conducted. Similar analyses are planned for other years. Analysis of historical precipitation data and individual storm data continued. In addition to Beatty and 4JA data, Las Vegas and Caliente data were included. Other data locations may be added as the study develops. The goal is to determine the frequency of wet-dry cycles and to determine the magnitude of storms which could be capable of producing runoff events in the Yucca Mountain region.

Planning Documents

Awaiting comments from DOE on YMP USGS SP 8.3.3.1.2.1.1, "Characterization of Meteorology for Site and Regional Hydrology."

Quality Assurance

All required QA reading assignments were accomplished.

Operations

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.1.2 Runoff and Streamflow

Principal Investigator - D. Beck

OBJECTIVE

To collect basic data on surface-water runoff at, and peripheral to, Yucca Mountain and its hydrologic flow system; to use the streamflow data to describe the runoff characteristics of the area and assess the response of runoff to precipitation; to assess the potential for flood hazards and related fluvial-debris hazards to the Yucca Mountain Project; and to provide basic data and interpretations of surface-water runoff to investigations that evaluate the amounts and processes of infiltration and ground-water recharge at Yucca Mountain and surrounding areas. (SCP Study 8.3.1.2.1.2)

SCP 8.3.1.2.1.2.1 Surface-water runoff monitoring

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

D. Bauer visited and serviced all regional surface-water monitoring sites on September 26 and 27. Precipitation readings at most sites averaged about 0.7 inches with evidence of minor runoff observed at several monitoring sites and in washes along the fan below the Calico Hills. Runoff was not observed or reported for the washes on Yucca Mountain or in Fortymile Wash.

Although streamflow did not occur during the year at Yucca Mountain or in Fortymile Wash, significant runoff did occur in a number of areas in southern Nevada. Peak estimates of discharge were made and documented during the summer for channel reaches along the upper and lower portions of the Amargosa River, and for washes in Ash Meadows, Mercury Valley, Overton, Moapa, Glendale, Searchlight, and Las Vegas. Data collected and processed from these flows is planned for inclusion into a report covering the water years 1986 to 1990.

Water samples were not collected during the year at any of the three designated water-quality sites along Fortymile Wash or in Dune Wash near Yucca Mountain as flow did not occur.

Progress continued on the data report for Surface-Water Monitoring activities for water years 1983 to 1985, although this was hampered as the Subdistrict YMP staff responded to the many runoff events in southern Nevada, which occurred during the summer.

Planning Documents

NHP was provided with detailed plans of projected work for the surface-water monitoring activities for FY 1991 and 1992. These plans are to be incorporated into the Planning and Control System (PACS) being initiated for the USGS-YMP studies.

Quality Assurance

Quarterly water-quality proficiency testing was not performed during the month because samples were not received from the USGS lab in Ocala, Florida. During the year, the YMP staff participated in 3 proficiency tests, attended a water-quality training workshop in Carson City, and participated in waterquality field trips for other USGS Subdistrict projects in southern Nevada.

D. Beck and M. Pabst completed reading assignments for QMP 3.04, R3, "Technical Review, Approval, and Distribution of YMP-USGS Publications," QMP 5.01, R4, "Preparation of Technical Procedures," and QMP 17.01, R4, "YMP-USGS records Management."

M. Pabst and R. Carman attended classroom training for AP-5.28Q, "Quality Assurance Grading," and QMP 17.01, R4, "YMP-USGS Records Management" in Las Vegas.

Further testing of new equipment for the project at the Subdistrict's instrumentation facility in Las Vegas were postponed pending receipt of capital equipment. During the year, evaluation of selected instrumentation was performed utilizing the water level tubes installed in the Subdistrict shop. Assessments were made and documented on the performance of various stage sensors and telemetry systems which were initially proposed for installation during the year.

Revised copies of technical procedure 115, R1, were distributed to all Subdistrict, field participants in the YMP program for updating manuals on technical procedures.

An initial draft of a technical procedure for the installation and use of the Fluid Data G-2 balance-beam manometer was begun during the month. This technical procedure will cover new equipment planned for the proposed continuous surface-water monitoring sites.

Operations

Most equipment needed for the construction of the six new surface-water gaging stations were received as of the end of the month. A few items are still on back-order and problems were encountered in the procurement of the Fluid Data Manometers. Permission has been received from the USGS California District to install and operate proposed streamflow gages on the Amargosa River in Inyo County, California.

Verbal authorization was received from the USGS radio frequency coordinator in Reston, Virginia, to use selected frequencies planned for the ALERT telemetry system. The authorization allows REECo to proceed with the procurement of ALERT capital equipment.

The ALERT base station located in the Las Vegas Subdistrict Office is now operational and network tests will begin pending the installation of receivers and telemetry lines by REECo Communications.

The installation of an ALERT base station at the HRF was canceled during FY 1990 as funding was not sufficient.

SCP 8.3.1,2.1.2.2 Transport of debris by severe runoff

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Several intense thunderstorms in southern Nevada generated scattered debris-transport events. These will be investigated as time allows.

Revisions were made to a report on flood and debris hazards in Genoa. This report will serve as a prototype for flood and debris hazards at Yucca Mountain, although it was funded independently.

Planning Documents

Study Plan 8.3.1.2.1.2 was approved by DOE and was scheduled to be submitted to NRC.

Ouality Assurance

R. Carman, a new member of the Carson City work group, underwent preliminary QA indoctrination and training in Las Vegas during the week of September 24th.

Operations

R. Carman was added to the project to assist in operations and quality assurance.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.1.3 Regional Ground-Water Flow System

Principal Investigator - J. Czarnecki

OBJECTIVE

To define the potentiometric distribution hydraulic properties, and recharge and discharge for the regional ground-water flow system to determine the magnitude and direction of ground-water flow. (SCP Study 8.3.1.2.1.3)

SCP 8.3.1.2.1.3.2 Regional potentiometric level distribution and hydrogeologic framework studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Planning Documents

J. Czarnecki provided scheduling input for the PACS exercise. Detailed descriptions of activities planned for the next 18 months were provided to D. Gillies for input into the Primavera schedule planner.

Quality Assurance

J. Czarnecki, S. Keller (SAIC/Golden), and M. Ciesnik prepared tables of technical procedures and scientific notebook plans to support activities called out in Study Plan 8.3.1.2.1.3 (Characterization of the Yucca Mountain Regional Ground-Water Flow System). The Study Plan has been compiled and sent to DOE/LV for QA review.

M. Ciesnik (a) completed YMP-USGS reading assignment QMP-17.01, R4 (Records Management); (b) participated in the software Configuration Control Committee where the software codes used on the project had been processed; (c) participated in the informal forum of the NHP's software users to

discuss the feasibility of implementation software quality assurance preliminary draft of QMP-3.03, R3; (d) performed an informal technical review of the preliminary draft of QMP-3.03; (e) participated in the exit meeting of the internal audit conducted during a two-week period by SAIC/Golden; (f) participated in a CASY symposium entitled "Fractures, Hydrology, and Yucca Mountain"; (g) researched existing technical procedures to determine which ones will need to be developed to meet future project needs; (h) participated in two training sessions on the UNIX system; and (i) became familiar with the newly installed LAN.

Operations

J. Czarnecki coordinated schedules for pickup, delivery, and installation of 2" steel casing for piezometers constructed in mining company drillholes to be started on or about the first week of October, 1990.

W. Oatfield continued error checking and file comparisons to determine discrepancies between USGS-GWSI versus USGS Carson City District potentiometric data. Carson City personnel were notified by letter of any discrepancies.

W. Oatfield helped ship equipment and supplies required for piezometer sampling to Mercury, NV.

J. Czarnecki discussed plans for the upcoming Southern Basin and Range Transect (SOBART) meeting in Phoenix (Oct. 9-11) with W. Dudley (USGS YMP) and W. Werrell (National Park Service, Ft. Collins). Czarnecki is scheduled to present a talk discussing the hydrologic relation between Amargosa Valley and Death Valley, and how deep drilling might provide insight into the flow system of Yucca Mountain and vicinity.

J. Czarnecki prepared a report for the California State Lands Commission on activities on state section 36, T. 25 N., R. 5 E., Inyo County, California. A well resulting from the conversion of a 2,000' mining company hole exists in this section.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.1.3.3 Fortymile Wash recharge study

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

No streamflow was observed in Fortymile Wash. Recent runoff evidence was noted on September 17 in nearby streams (Topopah Wash, Mercury Valley Tributaries, Rock Valley Wash, and the southern flank of the Calico Hills). USGS Nevada District surface water personnel were notified.

C. Savard updated a bibliography on chaos and strange attractors with articles on correlation integral methodology and applications.

C. Savard submitted an abstract entitled "Correlation integral analysis of South Twin River streamflow, central Nevada: Preliminary application of chaos theory" to the American Geophysical Union for presentation at the Fall 1990 meeting in San Francisco. The abstract was revised to incorporate USGS colleague, editorial, and Central Regional review comments, and discusses the methods and results of scoping work of applying chaos theory to characterizing Nevada streamflow.

C. Savard attended the USGS CASY meeting entitled "Fractures, Hydrology, and Yucca Mountain" held September 13 and 14 in Denver.

Planning Documents

<u>Ouality Assurance</u> C. Savard completed reading assignment HP-115,R1 and QMP-5.01,R4.

Operations

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.1.3.4 Evapotranspiration studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

D. Stannard and J. Czarnecki reviewed camera-ready text and illustrations for the USGS Open-File Report 90-356 entitled "Geohydrology and evapotranspiration at Franklin Lake playa, Inyo County, California."

Planning Documents

J. Czarnecki provided written input to D. Hoxie and W. Dudley to answer concerns by reviewers of the Site Characterization Plan regarding values of evapotranspiration used in a parameter estimation model published by Czarnecki and Waddell (1984).

Ouality Assurance

<u>Operations</u>

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling Principal Investigator - J. Czarnecki

OBJECTIVE

To synthesize hydrologic, geologic, hydrochemical, and geophysical data into a model and make a qualitative analysis of how the system is functioning; and to represent quantitative observations of hydrologic data pertaining to the ground-water flow system in a comprehensive flow model. (SCP Study 8.3.1.2.1.4)

SCP 8.3.1.2.1.4.1 Conceptualization of regional hydrologic flow models

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

J. Czarnecki revised an abstract entitled "From Where and by What Flow Paths Does Ground Water Beneath Yucca Mountain, Nevada Originate?" by J. Czarnecki, W. Steinkampf, and L. Kroitoru. The abstract was submitted in San Francisco.

J. Czarnecki prepared and delivered a talk entitled "Saturated-zone ground-water flow at Yucca Mountain, Nevada: Can fracture flow be adequately characterized?" by Czarnecki and A. Geldon at the CASY symposium entitled "Fractures, Hydrology, and Yucca Mountain." An abstract of the talk also has been prepared for a companion USGS Open-File Report. Czarnecki also served as meeting chairman for a half day session of talks.
J. Czarnecki reviewed a report entitled "Progress report on the construction of event trees in support of scenario development" by G. Barr, R. Barnard, and E. Dunn (all SNL). An apparent omission in the text was a discussion of the potential role of changes in future climate or tectonic setting and their potential impact on the large hydraulic gradient north of the design repository area.

J. Czarnecki revised a report entitled "Possible validation of the simulated ground-water flow system near Yucca Mountain with paleohydrologic evidence" per editorial and colleague reviews, for a USGS Bulletin on selected studies at Yucca Mountain.

J. Czarnecki met with B. Szabo (GD) to determine the likely success of determining the age of paludal sediments deposited in the Amargosa Desert through U-series dating. It is unlikely that carbonate cement is sufficient to provide a reasonable age. Attempts should be made to locate root casts with a carbonate core. Casts do exist in the indurated calcrete cap within these sediments.

Planning Documents

Ouality Assurance

J. Czarnecki reviewed and commented on USGS-QMP 3.03, R3 (Software Quality Assurance). These comments will be used in revision 4.

Operations

J. Czarnecki met with C. Fredrich (DOE/LV), D. Chestnut (LLNL), and L. Kroitoru (Weston/D.C.) to discuss the function and responsibilities of a Hydrology Integration Task Force. A compiled list of objectives was reviewed and a follow-up meeting scheduled for early November.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.2 Unsaturated Zone Hydrology

OBJECTIVE

To develop a model of the unsaturated zone hydrologic system at Yucca Mountain that will assist in assessing the suitability of the site to contain and isolate waste. (SCP Investigation 8.3.1.2.2)

WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration

Principal Investigator - A. Flint

OBJECTIVE

To determine the effective hydraulic conductivity, storage properties, and transport properties pertinent to unsaturated zone infiltration as functions of moisture content or potentia; and to determine the present and to estimate the future spatial distribution of infiltration rate over the repository block at Yucca Mountain. (SCP Study 8.3.1.2.2.1)

SCP 8.3.1.2.2.1.1 Characterization of hydrologic properties of surficial materials

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

After two weeks of preparation, a presentation was made at the NRC/DOE technical exchange in Denver on September 26 and 27.

Planning Documents

Comment resolution was completed for USGS-YMP-SP 8.3.1.2.2.1. All changes were incorporated and the final draft version was returned to DOE for confirmation.

Ouality Assurance

All QA reading assignments were accomplished as required.

Operations

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.2.1.2 Evaluation of natural infiltration

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Work continued on (a) writing the paper "Temperature Effects on a Hand-held Neutron Moisture Meter"; (b) the journal article on spatial variability of solar radiation at Yucca Mountain by A. Flint, A. Ritcey, and J. Istok; (c) geostatistical analysis of precipitation data to determine spatial distribution of individual storm events; (d) monitoring the moisture in the shallow unsaturated zone through the neutron logging program; (e) monitoring the class A evaporation pan in Jackass Flats in order to determine potential evaporation rates; (f) the writing of the research paper on calibration of tipping bucket rain gauges; (g) monitoring an instrument string, which was designed to monitor unsaturated conditions in alluvium, in a drill hole in Topopah Wash near Test Cell "C"; (h) several transects of Pageny and Split Washes in order to determine the relative areas and nature of surface materials; (i) collecting data from the radiation instrumentation, which collect precise data for each component of the radiation balance equation, in Jackass Flats. Several instruments were removed due to bird damage to the plastic domes.

After two weeks of preparation, a presentation was made at the NRC/DOE technical exchange in Denver on September 26 and 27.

Planning Documents

Comment resolution was completed for USGS-YMP-SP 8.3.1.2.2.1. All changes were incorporated and the final draft version was returned to DOE for confirmation.

Ouality Assurance

All QA related reading assignments were accomplished as required.

Review of the preliminary draft of QMP-3.03, R3 began.

Operations

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.2.1.3 Evaluation of artificial infiltration

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

After two weeks of preparation, a presentation was made at the NRC/DOE technical exchange in Denver on September 26 and 27.

Planning Documents

Comment resolution was completed for USGS-YMP-SP 8.3.1.2.2.1. All changes were incorporated and the final draft version was returned to DOE for confirmation.

Quality Assurance

All QA related reading assignments were accomplished as required.

Operations

Lack of personnel has halted all technical activities.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study Principal Investigator - J. Rousseau

OBJECTIVE

To determine the present in situ hydrologic properties of the unsaturated zone hydrogeologic units and structural features; to determine the present vertical and lateral variation of percolation flux through the hydrogeologic units and structural features; to investigate the relationships between present flux and past climatic conditions; and to determine the effective hydraulic conductivity, storage properties, and transport properties as functions of moisture content or potential. (SCP Study 8.3.1.2.2.3)

SCP 8.3.1.2.2.3.1 Matrix hydrologic-properties testing

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Water content, bulk density and porosity are being determined on core from the Apache Leap prototype drilling site in support of the calibration of the geophysical logging tools.

The liquid saturation procedure testing on core samples from Apache Leap prototype drilling site continued. Some samples were placed in relative humidity ovens to be dried at several relative humidities to determine the water content at which the pores have emptied and the water begins to leave the structure of the minerals. This is important to identify, because physical properties can be influenced from this resultant change in structure.

Development of a SPOC system to solve problems encountered and automate data collection continued.

A first draft of the research paper "The Influence of Scale on Sorptivity Values from Imbibition Experiments on Welded and Nonwelded Tuff" is in progress.

An evaluation of mathematical models, reported in the soil science literature, for relative permeability that require moisture retention characteristic data continued for use on tuff.

The permeability data report by A. Flint and L. Flint is still awaiting approval by NHP Central Region.

Preparation continued for a presentation to the NRC addressing specific topics. The presentation was then given to the NRC in Denver on September 26.

A planning meeting held in Denver to prepare for the DOE-NRC technical exchange meeting was attended by A. Flint and K. Richards.

Simulations of imbibition of water into rock core using the TOUGH code are being conducted to evaluate the appropriate formulations of moisture retention characteristic and relative permeability functions and to determine sensitivities to various physical parameters. This will also aid in the identification of appropriateness of different types of methods of measurement for the same parameter.

Planning Documents

The Matrix-property Study Plan is awaiting approval by DOE.

Quality Assurance

All QA related reading assignments were completed as required.

Operations

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.2.3.2 Site vertical-boreholes studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

1

The drafts of technical procedures NWM-USGS-HP-135, "Procedure for IDAS Development--Writing, Controlling, Testing, Implementing, and Documenting IDAS Software and Control Files" and NWM-USGS-HP-151, "Procedure for Software Installation, Operation, and Maintenance" were revised to incorporate comments from IDAS-project reviewers.

A summary of the August 10 CCC (Configuration Control Committee) meeting was prepared and submitted to IDAS-project participants.

A. Greengard met with R. Getzen and J. Baer September 11-13 to discuss revisions to IDAS technical procedures, the creation of IDAS Manuals for IDAS technical procedures, IDAS cross-training scheduled for October 22-26, 1990, and the conversion of all IDAS documents from WordMarc to WordPerfect.

A scheme was developed with the approval of the QA Office to internally track (i.e. within the IDAS project) IDAS Manuals. IDAS Manual Logs were created for all IDAS technical procedures.

Work continued on setting up experiments for imbibition and relative permeability testing. It was found that the psychrometer screen cages are becoming corroded during calibration; progress is being made on finding a solution. Maintenance work was done on the vacuum systems in the lab.

G. LeCain attended the CASY symposium on fractures and their influence on the Yucca Mountain hydrologic system September 13 and 14, 1990.

G. LeCain continued investigation of alternative Air K test methods and analysis.

G. LeCain reviewed a short technical report on ALTS geochemical prototype testing for C. Peters (YMP).

G. LeCain prepared and presented a synopsis of the USGS Air Permeability testing program, surface based, radial borehole and prototype at the NRC/DOE technical exchange September 26 and 27, 1990.

A. Balch presented the paper, "Seismic cross-borehole imaging of the near surface, using tomography

and prestack migration in elastic physical models," at the 60th Annual International Meeting of the Society of Exploration Geophysicists in San Francisco on September 27. The paper was well received.

A. Balch attended a DOE-NRC technical exchange meeting at Stapleton Plaza on September 26; he spoke on the vertical seismic profiling program as part of J. Rousseau's presentation.

J. Baer has modified the code for Instrument Maintenance, part of the IDAS System Maintenance Subsystem, which allows operators to change equipment configuration. He has also completed software specifications for entering instrument calibration information to this same subsystem. (New QA requirements for controlling and reporting instrument calibration were incompatible with IDAS database.)

W. Thordarson, C. Cope, J. Rousseau, and M. Kurzmack spent one week at the HRF lab testing the gas sampling system for finding dewpoints and isolated gas dewpoints at several mixing ratios and several temperatures using a source tank located in a constant temperature oven. After some plumbing adjustments were made to change mixing ratios, measured dewpoints in the lab were achieved which were fairly close to calculated dewpoints in the source tank.

M. Kurzmack spent one week at the HRF lab and installed serial cards and modems on the lab computers; replaced defective memory chips in computers; and tested various monitor programs.

C. Cope, C. Loskot, M. Whitfield met to resolve J. Rousseau's comments and make editorial changes to the UZ-6 open-file report. The report is being retyped and copies will be sent back to the authors for review.

J. Kume prepared a rough draft of the temperature section, and C. Loskot completed an outline and began writing the first draft of her part, of the GTUF prototype drillhole instrument report.

C. Cope completed all sections, except the last one on conclusions, for the WRI report on pressure transducer calibration and testing. Copies of the completed report will be given to M. Kurzmack and W. Thordarson for review during the first part of October.

C. Cope started analyzing transducer data from the second month of long-term calibration testing. This calibration does not include two of the original temperatures (13 and 10 degrees) and will not be fully comparable to the original calibrations; however, the third month of the long-term calibration experiment should be completed soon and will include all original temperature data. These data will be sent to Denver once they have been downloaded. Data that has been looked at so far indicates that no sensor drift has been seen between the second month of calibration and the original data (after original data were adjusted for similar temperature relationships).

J. Kume, C. Cope, J. Rousseau, W. Thordarson attended a 2-day CASY symposium on fracture and hydrology of Yucca Mountain.

J. Kume (a) read background material in preparation for a planning meeting for the DOE/NRC Technical Exchange scheduled for September 26 and 27 and presented the outline for J. Rousseau's presentation at the planning meeting; (b) continued to coordinate the development of the DISA design with machinists working for the Isotope Geology group; and (c) began preparing the first draft of a criteria letter for drilling and instrumenting three auger holes at the HRF.

* J. Rousseau, J. Kume, C. Cope, M. Kurzmack, attended a 2-day DOE/NRC technical exchange meeting at Stapleton Plaza, September 26 and 27. Rousseau made a presentation entitled "Deep Borehole Testing for Flow Processes."

* J. Kume prepared and issued an errata sheet for the open-file report on UZ-7 and attended a oneday demonstration of GIS.

M. Kurzmack (a) finished writing monitor.pas to allow simultaneous monitoring of various instruments or sensors; (b) worked with version 2.0 of Graf/Driv Plus which will provide better looking plots of data; (c) wrote the main section describing the hardware used in the GTUF prototype drill hole instrumentation test; (d) upgraded PEGRAF, CALGRAF, PTMREG and MONITOR to work with Graf/Driv Plus; and (e) attended CCC meeting and submitted five more programs to the SCM system.

G. LeCain completed the data reduction of the July, 1990, ALTS prototype testing. The data reduction consisted of transforming all the raw data voltages to pressures and temperatures.

G. LeCain continued to review the ALTS July, 1990, test data and plot pressure responses for analysis.

The two Druck pressure transducers that failed during ALTS testing were inspected by Druck, Inc., and found that one was fine and the other had water in the vent tube. This means both failures resulted from problems in the BOR assembly of the instrument bundles.

Planning Documents

The work plan for FY 1991 has been completed and the new IDAS work plan for 9/90 - 2/92 completed. Identification of tasks and time estimates were contributed by entire staff.

Ouality Assurance

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A new version of the program Wavesep is in preparation. It contains an improvement over the original code. When the version is completed, a copy will be provided to the QA group.

All IDAS staff are preparing for training in six technical procedures October 23-26. Duplicate IDAS system is being configured for training purposes.

A. Greengard is revising HP-151, "Software Operation" and promises a final draft of HP-151 with Attachments 1 and 2 for peer review by mid-October.

A. Greengard has completed a third draft of HP-135, "Software Development" that is compatible with QMP-3.03, R2 and with agreements reached with Software Configuration Management personnel. J. Baer made significant suggestions for improvement. HP-135 and attachments should be ready for peer review by mid-October.

* A scheme was developed with the approval of the QA Office to internally track (i.e., within IDAS) distribution of IDAS Manuals. A. Greengard is currently revising the 10 draft IDAS procedures (HP-133, HP-134, HP-135, HP-137, HP-140, HP-141, HP-142, HP-143, HP-150, and HP-151) to make their language consistent with this scheme. Internal control of distribution allows us to revise, review, and distribute manuals individually; tracking manuals (attachments to Technical Procedures) through the QA office required revision, review, and approval of a procedure and all attached manuals as an indivisible unit, which we found impractical for manuals that must be updated frequently.

A. Sims is still in the data-compilation stage of writing HP-144, "Procedures for Installation, Testing and Handling of DEC Computers and Equipment." A first draft of HP-144 may be completed by 31 October.

J. Kume revised Technical Procedures HP-189, R0 and HP-162, R0, and copied them from the Prime to disks and read background material on graded QA and QA reading assignment QMP-17.01, R4.

M. Kurzmack attended several meetings to finalize QMP-3.03, R3. A draft of 3.03 was released and discussions with scientists were begun.

C. Cope completed QA grading exemptions for the stemming, in-situ instrumentation, and monitoring section of the study plan; reviewed QMP 5.27 on graded QA; and attended a meeting with D. Porter on the subject of including all of our deep UZ percolation activities under a "non-exempt umbrella," until such time that there is a break down of subactivities or line items and exemptions are applied.

Operations

G. LeCain met with J. Boernge and T. Lippert (both USBR) and reviewed the USGS October '90 through July '92 work plan. The goals and responsibilities were outlined and the need to meet deadlines was stressed. Another review session was set for October 1, when the final work plan will be reviewed.

Preliminary contacts have been made with Sierra Geophysical regarding the possible purchase of their 3-D VSP modeling package.

Discussions are currently underway with Spectrum Corporation regarding the licensing arrangements to transport the V-seis package to the RS/6000 computer. The CSM Gould, which has the current V-seis, has been sold, and will soon be shipped out.

The transfer of the wavesip and migration packages to the Cray is nearly complete.

* IDAS staff decided to process and maintain our Technical Procedures using WordPerfect 5.1, rather than the USGS/WRD standard, Wordmark. SAIC/Golden and most other YMP participants use WordPerfect, which can handle some graphics as well as text. SAIC/Golden clerical staff is assisting A. Greengard in conversion of 10 draft procedures from Wordmark to WordPerfect format. Some software assistance was provided by J. Baer. Archival copies will be maintained on diskettes rather than Prime files.

• To conserve operational funds, generators supporting IDAS prototype field sites have been turned off when not needed for essential tests. In addition to usual generator problems (high cost, soil contamination by fuel and lubricants, unstable AC frequency, air-quality permits), a new problem was experienced this month: birds in the air intake.

* Diagnostic tests and frequent monitoring reveal that UPS batteries at UZ-1 are less reliable than claimed by manufacturer; low battery voltage when generators were off (July-August) seems to be the result of two defective cells in 120-cell string. REECo is negotiating in-warranty replacement with Gould, the manufacturer.

M. Kurzmack installed Netware 386 on Everex File server. The hard disk controller card went down and it took nine days with the dealer in Maryland, Everex in California, and the service bureau in Denver, to get a replacement. The files on Netware 2.15 server were transferred to a new server.

C. Cope is working with B. Bishop (Druck Inc.) on decreasing the diameter of the cable and number of lead wires coming out of the pressure transducers in order to reduce the size of the downhole instrument apparatus.

C. Loskot contacted close to 40 vendors as part of a market survey to locate a manufacturer for a humidity generator and is reviewing articles on humidity generation to locate an acceptable unit for use in the HRF calibration laboratory.

J. Boernge continued on design options for the support trailer and structural design of the trailer hoist;

continued design and component fitting of interval pipe and packer assembly for the downhole instrument; and reviewed injection line and sampling line solenoid valve requirements and started inquiry into sources for additional solenoid equipment.

J. Boernge and G. LeCain held design and fabrication status meetings.

USBR shops modified the support trailer to carry four packer storage tubes; received eight electrical connectors for the downhole instrument assembly; and received and inventoried three pallets of nylon tubing for the downhole instrument assembly. The tubing will be stored until the reel assembly to hold the tubing arrives.

Changes in Future Plans (Plans not described in Work Plan)

M. Kurzmack received the wrong model of Big Bin Paper Feeders. These were returned and the correct model was sent, but only one of three worked correctly. Two were returned and replacements were sent.

<u>WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study</u> Principal Investigator - B. Lewis

OBJECTIVE

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To conduct hydrologic tests in the ESF to supplement and complement the surface-based hydrologic information needed to characterize the Yucca Mountain site; to provide phenomenological information for analyzing fluid flow and the potential for radionuclide transport through unsaturated fractured tuff; and to provide information about water flow through unsaturated fractured tuffs. (SCP Study 8.3.1.2.2.4)

SCP 8.3.1.2.2.4.1 Intact-fracture test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

A Summary for a symposium sponsored by the American Nuclear Society in April/May, 1991, was submitted September 6.

G. Severson attended the CASY Symposium "Fractures, Hydrology, and Yucca Mountain."

Deliverables to be completed by Dr. Cardenas for FY91 were outlined in letter format.

A draft of preliminary technical procedure for collecting intact radial core fractures is with J. Boernge.

The problem concerning corrosion in stainless steel plumbing for the vacuum oven in the laboratory is still unresolved. Partial results have been received from the last two water samples collected from the vacuum oven cold trap.

The Satec load frame was calibrated to NIST traceable standards September 19.

Review comments from the Peer Review Team and Abstracts for 1990 Soil Science Society of America annual meeting in October were read.

G. Severson attended the NRC/DOE technical review of UZ hydrology in Denver on September 26 and 27; gave tour of the Building 20 laboratory; and discussed project work with R. Green and D. Chery from NRC on September 28.

Planning Documents

Quality Assurance

The QMP manual was updated and two QA reading assignments were completed.

Operations

G. Severson met with sales representatives from Azonix, Kewaunee, and Hi Tech to discuss RTD wiring, laboratory equipment, and an extensive product line including plumbing hardware, respectively.

Cable and hardware for communications lines between FRHP lab and Branch of Geochemistry computer room was delivered. Cards, etc. will be ordered on a requisition with FY91 funds. Cable for communications will be laid early October.

Search and evaluation of LVDT manufacturers which may meet or exceed technical specifications of instruments made by Schlumberger is near completion.

A request was placed with MKS office in Boulder, Colorado, to replace the gas flow monitor made August 6. The Boulder office is still trying to determine why the instrument has not been received.

The pursuit of "sleeves" for the upright rods on the laboratory bench tops continued. Other suppliers of hardware were contacted during the month and the decision will be made on configuration and logistics of having work completed during October.

A vendor for tubing and hardware for the vacuum oven in the laboratory was located.

Requisition requests to continue leases for GenRad and Welch Allyn equipment for FY91 were submitted.

G. Severson reviewed the USGS Safety and Environmental Health Handbook and attended training courses on September 17, 18, and 21 for OSHA Laboratory Safety Standards compliance.

Replacement light bulbs for the Moire projector and a sample of Wood's metal were shipped to Dr. Cardenas. The Wood's metal sample will be used to determine to what degree it will act as a "white body".

Changes in Future Plans (Plans not described in Work Plan)

Due to closure of G-Tunnel, projected axial sampling is temporarily suspended; due to the spending freeze, procurement of needed equipment is temporarily delayed; and due to lack of funding support for the USBR Co-Investigator on Sampling Methods Test, the technical procedure for radial sampling will be delayed until funds are available or another Co-Investigator finishes procedure.

SCP 8.3.1.2.2.4.2 Percolation tests in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Two imbibition tests were performed on sample 13B, a core (D=4.13cm, L=7.35cm) of welded tuff with a fracture traversing its length. In the first test, the core was held intact by plastic bands so that in addition to water imbibed by the wetted end, water was also pulled by capillarity into the fracture and subsequently by the matrix. In a second test, the two halves of the core were separated and the cumulative imbibition into the two half-cores from the wetted ends alone was recorded. At any time, the cumulative imbibition into the intact core was greater than that into the two half-cores, thereby indicating that capillary processes were operative in the fracture. An attempt will be made to estimate the hydraulic properties of both the fracture and matrix from the transient imbibition data.

An imbibition test was completed on sample 9B with the sample sealed from all sides except the bottom, where water was allowed to imbibe into the sample. In addition to observations on the mass of water imbibed, three pressure transducers monitored the increase in air pressure as air imbibition rates will be compared with those measured on the same core with the top of the core open to the atmosphere to determine the relative decrease in imbibition rates that may occur as a result of entrapped air.

F. Thamir completed a summary of a paper entitled "An Alternative method to the Mariotte Reservoir for maintaining a constant hydraulic pressure." The summary was submitted to the American Nuclear Society to be considered for the 1991 International High-Level Radioactive Waste Management Conference to be held between April 28 and May 2, 1991, in Las Vegas.

The experimental design which is currently planned for introducing and removing water to and from the large welded tuff block (54.3 cm long X 29.7 CM wide X 80.6 cm high) was tested using sample 9A, a core of nonwelded tuff 7.34 cm long with a diameter of 7.53 cm. An IMED infusion pump introduced water to the upper boundary of the sample. Water was removed from the base of the sample using a porous plate and hanging water column. The sample permeability seemed to change during the test for as yet unknown reasons. Clogging of the lower plat by diatomaceous earth used to bond the lower plate to the base of the core is being investigated as a possible cause.

M. Brodie wrote the computer program which controls the IMED pump which introduced water to the core in the above test.

Planning Documents

Ouality Assurance

M. Brodie continued to resolve problems associated with psychrometer calibration. An additional cleaning step using a degreaser, and subsequent rinsing with de-ionized water, as well as eliminating rust problems on the calibration chambers by using teflon gaskets, will hopefully eliminate some of the problems.

Operations

S. Anderton performed maintenance on the vacuum systems, including those in the pump and ovens, as well as a major cleanup of the rocksaw in the lab. Anderton is also trying to locate calcium selenite which should prevent bacterial growth from clogging ceramic plates or the rocks themselves in experiments of long duration.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

SCP 8.3.1.2.2.4.3 Bulk-permeability test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

C. Boughton presented a summary of this study at the NRC/DOE technical exchange meeting held in Denver on September 26 and 27, 1990.

Planning Documents

C. Boughton reviewed NUREG 1347, NRC comments regarding statutory SCP, to evaluate the need for enhancement of response to NRC comments during NRC/DOE technical exchange meeting held

in Denver on September 26 and 27, 1990.

Quality Assurance

Operations

C. Boughton participated in ongoing preparation of PACS input.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3,1.2,2,4.5 Excavation-effects test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

C. Boughton presented a summary of this study at the NRC/DOE technical exchange meeting held in Denver on September 26 and 27, 1990.

Planning Documents

C. Boughton reviewed NUREG 1347, NRC comments regarding statutory SCP, to evaluate the need for enhancement of response to NRC comments during NRC/DOE technical exchange meeting held in Denver on September 26 and 27, 1990.

Quality Assurance

Operations

C. Boughton participated in ongoing preparation of PACS input.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.2.4.7 Perched-water test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

* Neutron logging in boreholes at Yucca Mountain was conducted.

* M. Chornack participated in field reconnaissance for surficial cover and fracture study for determination of natural infiltration at Yucca Mountain.

Planning Documents

M. Chornack completed the PACS summary account sheets.

Quality Assurance

* M. Chornack worked on technical procedures for the detection and recognition for perched water; started Graded QA for drilling portion of the surface-based deep UZ program; and read all required QA reading assignments.

Operations

M. Chornack wrote the drilling and geology section of the Wet and Dry Drilling report to be included in the INTRAVAL report; coauthored a poster session presented at the CASY meeting held in September in Denver; and attended the DOE/NRC meeting to discuss comments from the PRT. Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.2.4.9 Multipurpose-borehole testing near the exploratory shafts

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

* Neutroń logging in boreholes at Yucca Mountain was conducted.

* M. Chornack participated in field reconnaissance for surficial cover and fracture study for determination of natural infiltration at Yucca Mountain.

Planning Documents

M. Chornack completed the PACS summary account sheets.

Ouality Assurance

M. Chornack worked on technical procedures for the detection and recognition for perched water; started Graded QA for drilling portion of the surface-based deep UZ program; and read all required QA reading assignments.

Operations

* M. Chornack wrote the drilling and geology section of the Wet and Dry Drilling report to be included in the INTRAVAL report; coauthored a poster session presented at the CASY meeting held in September in Denver; and attended the DOE/NRC meeting to discuss comments from the PRT.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry

Principal Investigator - I. Yang

OBJECTIVE

To understand the gas transport mechanism, direction, flux, and travel time within the unsaturated zone; to design and implement methods for extracting pore fluids from the tuff; to provide independent evidence of flow direction, flux, and travel time of water in the unsaturated zone; to determine the extent of the water-rock interaction; and to model geochemical evolution of ground-water in the unsaturated zone. (SCP Study 8.3.1.2.2.7)

SCP 8.3.1,2.2.7.1 Gaseous-phase chemical investigations

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Final gas sampling at Apache Leap Site, Arizona, was conducted from September 19-26, and the packer system was pulled out from the hole on September 27, 1990. SF_6 was injected into zone #2 and #4, and gas was pumped from #1 and #3. No SF_6 was detected from zone #1 and #3. (That is, inflatable packers were working okay.)

Gas samples collected from prototype holes during the last 2 weeks in August were degassed in the Denver Laboratory for ${}^{14}C$ and ${}^{13}C/12_C$ ratio measurements.

A. Yang presented "Geochemical and isotopic methods for determining flow paths and travel time" on September 26, 1990 at DOE-NRC Technical Exchange on Unsaturated-Zone Hydrology meeting held in Stapleton Plaza Hotel, Denver.

J. Ferarese, P. Striffler and C. Peters attended the Laboratory Safety training at the Denver Federal Center September 18, 1990.

A. Yang and C. Peters attended the CASY symposium "Fractures, Hydrology, and Yucca Mountain" held at the Holiday Inn, Golden, Colorado, on September 13 and 14, 1990.

* Using a new integrator to calculate the results of GC analysis was tested. It may be a worthwhile method for use in future analyses at field sites.

• The plotter for high resolution graphs and charts is now operational.

* USGS staff met with USBR engineers concerning the renovation of building 56. Another meeting to discuss the details of the renovation will be scheduled in early October. It appears that this renovation will completely disable the laboratory for a minimum of two weeks.

Planning Documents

Quality Assurance

A. Yang and W. Shaw read QMP-17.01, R4 and QMP-5.01, R4.

A revised draft of QMP-3.03, R3 on Software Quality Assurance was sent out to the principal investigators for informational review.

Technical Procedure, HP-131, was revised and approved by September 28, 1990.

HP-86 was reviewed for author adequacy and was found to have an error. Again, it was sent back to SAIC/Golden for retyping.

J. Ferarese and C. Peters completed all assigned Quality Assurance reading assignments.

Field and laboratory summary sheets have been updated.

Operations

J. Major and USBR Arizona Office personnel assisted in the successful removal of the gas sampling tool from the test hole at the Apache Leap Test Site on September 27.

The Unsaturated-zone Hydrochemistry Project mobil laboratory at Apache Leap Site, Arizona, was driven back to the Nevada Test Site on September 28, 1990. The Laboratory Vehicle will be sent in for a maintenance check and probably will be remodeled with a higher capacity air conditioner.

J. Ferarese met with J. Woolverton to discuss the reasons why HP-160 was being held from final approval. After meeting, it was decided that HP-160 could be finalized.

Various purchases for the laboratory were made.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Cores from prototype hole in Apache Leap Site (short hole) were transported from the Sample Management Facility to A. Yang in Denver on September 24, 1990. These samples will be squeezed to obtain gas samples to determine the depth of SF_6 penetration into the wall of the core. All core samples were inventoried and are accounted for.

Carbon-14 background samples in the Teflon Vials of 3ml, 4ml and 5ml volumes were counted in the new Liquid Scintillation Counter for background-count-rate determinations.

A. Yang presented "Geochemical and isotopic methods for determining flow paths and travel time" on September 26, 1990 at DOE-NRC Technical Exchange on Unsaturated-Zone Hydrology meeting held in Stapleton Plaza Hotel, Denver.

A. Yang attended the "Radionuclide Adsorption Workshop" sponsored by Los Alamos National Laboratory on September 11 and 12, 1990, at Hill Top Hotel, Los Alamos, New Mexico.

A. Yang and C. Peters attended the CASY symposium "Fractures, Hydrology, and Yucca Mountain" held at the Holiday Inn, Golden, Colorado on September 13 and 14, 1990.

* Plotter for high resolution graphs and charts is now operational.

* USGS staff met with USBR engineers concerning the renovation of building 56. Another meeting to discuss the details of the renovation will be scheduled in early October. It appears that this renovation will completely disable the laboratory for a minimum of two (2) weeks.

Performance verification and calibration procedures were run on both Liquid Scintillation Counters.

A set of nine distilled tritium water samples were screened in the Packard Liquid Scintillation Counter. These samples counted extremely high, which was unexpected. Causes for this anomaly are being investigated.

Engineers from Dionex came to the laboratory and helped J. Ferarese set-up the Ion Chromatograph for running simple anions.

Planning Documents

Ouality Assurance

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A. Yang and W. Shaw read QMP-17.01, R4 and QMP-5.01, R4.

QMP-3.03, R3 on Software Quality Assurance revised draft was sent out to the Principal Investigators for informational review.

Technical Procedure HP-131, was revised and approved by September 28, 1990.

J. Ferarese and C. Peters completed all assigned Quality Assurance reading assignments.

Field and laboratory summary sheets were updated.

Instructions on the operation of the Wallac Liquid Scintillation Counter were introduced into HP-202. Prior to this the HP was in technical review.

Operations

The Unsaturated-zone Hydrochemistry Project mobil laboratory at Apache Leap Site, Arizona, was driven back to the Nevada Test Site on September 28, 1990. The Laboratory Vehicle will be sent in for a maintenance check and probably will be remodeled with a higher capacity air conditioner.

Various laboratory purchases were made.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.2.8 Fluid Flow in Unsaturated Zone Fractured Rock

Principal Investigator - C. Boughton LBL Principal Investigator - G. Bodvarsson

OBJECTIVE

To develop and validate conceptual and numerical models describing gas flow and liquid water and solute movement in unsaturated, fractured rock at the laboratory and sub-REV scales. (SCP Study 8.3.1.2.2.8)

<u>SCP 8.3.1.2.2.8.1</u> Development of conceptual and numerical models of fluid flow in unsaturated, fractured rock

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Simulations were performed with TOUGH code, in conjunction with FMMG code, to generate an equivalent continuum hydraulic conductivity-matric potential relation for a simple fracture network in which each fracture was assigned identical properties as all others in the network. As expected, the resulting fracture continuum relation was displaced from the relation for the individual fractures by a constant amount of this very simple case. In the future, more complex networks with fractures having different characteristics will be analyzed.

VSFRACW and VSFRACD codes were constructed for relative permeability and saturation versus matric potential relations for wetting and drying conditions for fractures with average volumetric apertures of 25 and 100 microns. These will be incorporated into the type of analysis described above.

An attempt was made to fit the relative permeability and moisture retention functions of van Genuchten to data for selected samples drawn from those described in the forthcoming report on matrix properties by A. Flint and L. Flint (1990). It was observed that parameter values for the van Genuchten function as obtained from best-fit matches of the relative-permeability data were significantly different from those obtained from best-fit matches of the moisture retention data. This means that, for the limited number of samples analyzed, the moisture retention curves had little predictive value with regard to the relative permeability-moisture content relations.

C. Boughton completed changed in response to technical and editorial comments on CASY Bulletin paper by Marvil, et al., "Prototype testing of instruments for monitoring water and tracer movement in the proposed exploratory shaft percolation test at Yucca Mountain, NV."

C. Boughton and Ed Kwicklis attended CASY Symposium on fractures which was held in Denver on September 13 and 14. R. Healy presented preliminary results from work described above at the same Symposium.

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On Friday, September 27, C. Boughton met with J. Robertson of the Calico Hills Risk Benefit Analysis Task Force concerning tests which might be conducted in drifts of the Calico Hills.

C. Boughton participated in the monthly CASY meeting on September 12 in which W. Dudley presided as the new acting Chairman of CASY.

Several members of the UZ Fractured Rock Hydrology Project attended the NRC technical exchange on Unsaturated Zone Hydrologic Characterization held in Denver on September 26 and 27. E. Kwicklis made a presentation on process oriented modeling and C. Boughton made a presentation on laboratory and field scale studies being made in support of the process oriented modeling. Several weeks of preparation were spent cumulatively by the staff to provide graphics and text for this workshop.

C. Mallon completed RAD.F77, a solar radiation model for P. McKinley. This program provides a graph of solar radiation vs. Julian day for the year 1989, as well as print outs of solar radiation for each Julian day for several years. Mallon met with E. Maxwell, Solar Energy Research Institute, to discuss solar energy equations used in the model. She also met with McKinley to assure that the program met McKinley's needs.

C. Mallon attended a training session on the UNIX operating system and met with W. Sockriter about obtaining a login on the SUN.

E. Kwicklis and C. Boughton met with DOE representatives and other USGS UZ staff in a planning meeting on September 18 for the NRC technical exchange which was held on September 26 and 27.

The entire UZ Fractured Rock Hydrology staff, along with D. Gillies and B. Lewis, attended a dry run of C. Boughton's presentation for the NRC technical exchange at the request of DOE.

C. Mallon wrote a program ERRCHK.F77 to check for errors in data files prior to their being processed through RAD.F77.

C. Mallon wrote a program APPEND.F77 to append date files to create on file containing data for an entire year for processing by RAD.F77

R. Zimmerman attended the USGS/CASY workshop on "Fractures, Hydrology and Yucca Mountain" in Denver on September 13-14. A poster paper titled "Fluid Flow in Rough-Walled Fractures," by R. Zimmerman, S. Kumar, and G. Bodvarsson was presented by R. Zimmerman.

G. Bodvarsson attended the "TOUGH Users' Workshop" at Lawrence Berkeley Laboratory on September 13 and 14. A paper titled "Incorporation into TOUGH of an Analytical Source-Sink Term for Fracture/Matrix Flow," by R. Zimmerman and Bodvarsson was presented by Bodvarsson.

Work began by R. Zimmerman and G. Bodvarsson on a report titled "Dual Porosity Model for Unsaturated Flow in Fractured Media," describing the incorporation into TOUGH of analytical source/sink expressions for fracture/matrix flow.

An abstract titled "Lubrication Theory Analysis of the Permeability of Rough-Walled Fractures," by R. Zimmerman, S. Kumar, and G. Bodvarsson, was submitted to the 1990 Fall Annual Meeting of the American Geophysical Union, December 3-7, in San Francisco.

An abstract of a paper titled "Fractal Characteristics of Fracture Roughness and Aperture Data," by S.

Kumar and others was submitted for the 1991 International High-Level Radioactive Waste Management Conference, Las Vegas, Nevada, April 23 - May 3, 1991.

Planning Documents

The Study Plan for Conceptual and Numerical Modeling in Unsaturated, Fractured Rock has been submitted to DOE for review.

Ouality Assurance

C. Mallon participated in the committee to revise Software Quality Assurance QMP3.03 (R3). This participation included completion of the draft of R3, meeting with several PI's, both individually and in an informal review meeting, to discuss their reactions to R3, meeting with the TPO to discuss the review process of R3, and meeting with the Software Quality Assurance Specialist to discuss scheduling of a meeting to discuss changes from the previous revision (R2).

C. Mallon participated in an Internal USGS Surveillance of A. Yang's Sample Management System, covering APs 6.2, 6.3, and 6.4. Mallon conducted follow-up activities regarding use of current APs dealing with examination and removal of core at the SMF as she was requested to do by B. Bennington. The follow-up resulted in changes in the manner in which information was being logged into the sample tracking system log.

C. Boughton was not requested to attend any Configuration Control Committee meetings as NHP representative during the month of September, 1990. Apparently there were no NHP related issues to come before the committee during that time period.

C. Mallon completed Software Quality Assurance documentation for the Precipitation-Runoff Modeling System, including completing an MBR, an SSF, and an SAD, labeling pages of supporting publication, labeling and numbering pages of source code listing, and writing a memorandum to the SCM Librarian regarding updates to the User's Manual.

C. Boughton, E. Kwicklis, and C. Mallon completed reading assignments and replaced pages in controlled documents as required.

C. Mallon retrieved Lotus 123 regressional analyses for several pressure transducer calibrations.

T. Mendez-Vigo of SAIC visited LBL in order to take an inventory of documents to be considered for duplication.

QA reading assignments were completed by various personnel

Operations

C. Boughton participated in ongoing preparation of PACS input.

C. Boughton conducted annual personnel review for C. Mallon and provided that evaluation to Foothills.

C. Boughton prepared Statements of Work for two positions under the Foothills contract.

Communication with LBL regarding ongoing activities was maintained. LBL input was incorporated into FY91 PACS input.

<u>Changes in Future Plans</u> (Plans not described in Work Plan) No participation in ESTC and Moisture Flow Field Working Group due to limitation of travel funds. Work is proceeding using a reduced work scope, because LBL funding is lower than anticipated.

WBS 1.2.3.3.1.2.9 Site Unsaturated Zone Modeling and Synthesis

Principal Investigator - B. Lewis

LBL Principal Investigator - G. Bodvarsson

OBJECTIVE

To develop conceptual and numerical models for the site unsaturated zone hydrogeologic system; to apply the models to predict the system response to changing external and internal conditions; to evaluate the accuracy of the models using stochastic modeling, conventional statistical analyses, and sensitivity analyses; and to integrate data and analyses to synthesize a comprehensive qualitative and quantitative description of the site unsaturated-zone hydrogeologic system under present as well as probable, or possible, future conditions. (SCP Study 8.3.1.2.2.9)

SCP 8.3.1.2.2.9.1 Conceptualization of the unsaturated-zone hydrogeologic system

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

The first draft copy of the USW UZ-6 basic data report is being typed for colleague review.

On September 11, C. Peters, W. Steinkampf, and M. Whitfield met with Dr. Dumke, representing the Bundesanstaet für Geowissenschaften und Rohstaffe, of West Germany. His primary interest was regarding low-level waste disposal in sands and clays and he was given the names of USGS scientists conducting such studies.

B. Lewis attended an ESF/ACS Hydrologic Testing and Postclosure Health and Safety meeting in Albuquerque, NM, from September 4 through 6, to formulate scoring information packages.

A CASY technical symposium, "Fractures, Hydrology, and Yucca Mountain," was held in Golden on September 13-14, and was attended by most of the UZ investigators.

A planning meeting for the DOE-NRC Technical Exchange meeting was held on September 18 in the National Training Center and was attended by the UZ project chiefs and investigators.

B. Lewis attended a CHN Task Force meeting in Las Vegas, NV, on September 17 and 18, to plan for and outline presentations to be given at upcoming NWTRB and NRC technical exchange meeting.

The DOE-NRC Technical Exchange on Unsaturated-Zone Hydrology was held on September 26 and 27 in Denver. Presentations on UZ studies were made by A. Flint, J. Rousseau, G. LeCain, A. Yang, C. Boughton, and E. Kwicklis. B. Bodvarsson and D. Hoxie discussed site-scale flow modeling and data requirements.

Technical reviews of the Integrated Data System Functional Requirements Document, Revision 1.1, was completed on September 26 by F. Thamir, M. Brodie, and R. Whitfield.

The first phase of the tracer gas sampling that was being conducted at Apache Leap from prototype borehole UZP-5 was completed on September 27 and the packer system was pulled from the borehole.

Planning Documents

The Study Plan 8.3.1.2.2.9 (UZ Modeling and Synthesis) is being reviewed by B. Bodvarsson (LBL).

Quality Assurance

Reading assignments and current revisions of QMPs were distributed to UZ investigators.

Operations

The 1991 PACS schedule, deliverables, and budget for the UZ activities were developed by B. Lewis and submitted to the Program Analyst on September 25. The information provided was based on given assumptions and activity priorities, and are subject to revision when the FY 1991 funding has been determined.

Training sessions on lab safety and chemical spills were conducted in Bldg. 53 on September 18-21 and were attended by G. LeCain, F. Thamir, P. Striffler, J. Ferarese, and R. Whitfield.

On September 20, J. Magner, Manager of the Core Library in Mercury, showed a 40-minute video tope on Security and Safety at the NTS for employees who have not seen it within the past 2 years or those who have not seen it at all.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

SCP 8.3.1.2.2.9.2 Selection, development, and testing of hydrologic-modeling computer codes

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

G. Bodvarsson attended a planning meeting on September 28 in Denver for the DOE-NRC Technical Exchange on Unsaturated Zone Hydrologic Characterization.

G. Bodvarsson presented an overview of USGS/LBL work on site-scale modeling for DOE-NRC Technical Exchange on Unsaturated Zone Hydrologic Characterization, held in Denver on September 26 and 27.

Planning Documents

The study plan on Site Unsaturated Zone Modeling and Synthesis is being technically reviewed by LBL-YMP staff.

Quality Assurance

T. Mendez-Vigo of SAIC visited LBL in order to take in inventory of documents to be considered for duplication.

QA reading assignments were completed by various personnel.

Operations

<u>Changes in Future Plans</u> (Plans not described in Work Plan) Work is proceeding using a reduced work scope, because LBL funding is lower than anticipated.

WBS 1.2.3.3.1.2.10 Prototype Hydrologic Tests that Support Multiple Site Characterization

Activities

Principal Investigator - B. Lewis

OBJECTIVE

To perform prototype hydrologic tests to minimize costly stand-by times; to develop QA procedures; to determine feasibility of the proposed tests; to train new personnel; to help increase likelihood of success of the tests; and to test new instruments, equipment, and procedures.

Prototype Tracer Testing

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Continued writing Water Supply Paper on borate adsorption, composing abstract, conclusions, and section on selection of tracers. Continued revision of previously written sections: dissolution and adsorption test methods section, results section and discussion section.

Improved figures and table for the borate paper that had been intended for publication in the USGS CASY Bulletin. This paper will probably be sent to an outside journal for publication.

Final report on "Analysis of anionic tracer transport" was submitted by the New Mexico Institute of Mining and Technology to the USGS, September 10, 1990, according to contract No. 14-08-0001-2637, along with computer code No. 2 (HYTEQ Version 1.0) on a floppy diskette.

Planning Documents

Ouality Assurance

Computer code No. 2 (HYTEQ Version 1.0) used for tracer transport will be sent to USGS-YMPB Quality Assurance office for approval.

Operations

Changes in Future Plans (Plans not described in Work Plan)

Prototype Optimal Rubble Size

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

All nonwelded cores from rubble have been squeezed. Gas from the squeezed cores has been analyzed. Choose H_2O samples from nonwelded cores to be analyzed. Began selection of rock samples for analysis. The in-house calibration on the Supercell is continuing.

Planning Documents

Quality Assurance

Hydrologic Procedure Preparations are continuing and all Quality Assurance assignments were completed.

Operations

USBR continued assembly of components for the second-generation (high-pressure) extraction cell for

use in pore water expression from rubble samples. A requisition is being prepared for consulting services for final assembly, since this involves new methods and requires careful consideration of safe future use of the equipment.

Have begun looking for two (2) new personnel to replace the three (3) that have left.

Changes in Future Plans (Plans not described in Work Plan)

Prototype Dry Coring of Rubble

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Sealing and storage testing continuing; 40 cores from the Apache Leap site were sealed in various manners as part of this work.

Welded rubble coring has begun in the US Bureau of Reclamation laboratories.

Water samples to be sent to Huffman laboratory for analysis have been sent.

Crystal Research has begun the rock sample analysis.

Planning Documents

<u>Quality Assurance</u> Hydrologic Procedure Preparations are continuing.

All assigned Quality Assurance assignments were completed.

<u>Operations</u> Have begun looking for two (2) new personnel to replace the three (3) that have left.

Changes in Future Plans (Plans not described in Work Plan)

Prototype Pore-Water Extraction

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

J. Higgins began writing a technical paper titled, "Pore-Water Extraction from Unsaturated Tuffs Using One-Dimensional Compression." The paper is intended to be published in the 1990 International High-Level Radioactive Waste Management conference proceedings volume.

Planning Documents

Quality Assurance

The Satec Press was calibrated by Satec Inc.

The digital thermometer was calibrated by the manufacturer.

Quality Assurance reading assignments were completed by J.Higgins.

Operations

J. Prizio met with J. Higgins to discuss project status and budget and to coordinate operations.

J. Higgins and C. Peters delivered pore-water samples to the contract laboratory for chemical analysis and met with the chemist to discuss testing procedures.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.3 Saturated Zone Hydrology

OBJECTIVE

To develop a model of the saturated zone hydrologic system of Yucca Mountain that will assist in assessing the suitability of the site to contain and isolate waste. (SCP Investigation 8.3.1.2.3)

WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-Water Flow System

Principal Investigator - R. Luckey

OBJECTIVE

3

To determine the hydrogeologic nature of the Solitario Canyon fault in the saturated zone; to determine the time and spatial variation of the potentiometric surface; to determine the character, magnitude, and causes of waterlevel fluctuations; to estimate elastic and hydraulic properties; to determine transport properties of the saturated zone; to evaluate the relation between hydraulic properties and fracture characteristics; to characterize chemical and physical properties of the saturated zone that affect radionuclide retardation; and to conduct single-andmultiple well tracer tests using conservative and reactive tracers to determine hydrologic, chemical, and physical properties in the saturated zone. (SCP Study 8.3.1.2.3.1)

SCP 8.3.1.2.3.1.2 Site potentiometric-level evaluation

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Continuous water-level network -- dumped data loggers and processed data twice this month. Transducers calibrated at the following wells: UE-25 WT#13, USW G-3, USW H-1 (tube 1), USW H-4 (upper zone), USW H-4 (lower zone), and UE-25 WT #6. Transducer replaced at the following wells: UE-25c #3, USW H-6 (upper zone), and USW H-6 (lower zone). All instrument calibrations are up to date.

Periodic water-level network - made periodic measurements once this month.

Several apparent water-level anomalies occurred at USW G-3 starting at 1200 hours on September 15. The largest started on September 23 and continued into September 24. Field personnel went to the site on September 15 and twice on September 24 to manually determine the water level but the results were inconclusive as to whether the water level had actually changed.

Transducers at wells UE-25c #2 and UE-25c #3 were removed so that the packers could be removed from these wells. The transducers were removed shortly before the estimated start date of the work, but the work was subsequently delayed. The transducers will remain out of these wells unless the work is canceled or significantly delayed.

Draft report "Water levels in continuously monitored wells in the Yucca Mountain Area, Nevada, 1989" by G. O'Brien was revised following colleague review and was submitted for NHP review on September Data-collection platforms at USW G-3 and USW H-5 are operating well. Backup data was collected from the platforms and transmitted directly to the Prime computer. The backup data was spot checked against the data coming through the satellite to verify that the transmission system was operating properly. Plans are being finalized to install two additional platforms, one at USW H-4 and one at USW WT-11. The plan is to have these platforms operational within two months.

G. O'Brien continued an evaluation of data obtained from the continuous water-level network during 1989. D. Lobmeyer completed his independent evaluation of the 1989 data. Both evaluations are being composited into a single evaluation that will determine what transducer output will be converted to water levels.

Several project members attended the symposium "Fractures, Hydrology, and Yucca Mountain." They all got some ideas on how to conduct future tests at Yucca Mountain and how a conceptual model of the flow system might be formulated.

Splice tubes to connect transducers to wire line cable were received this month. These tubes should prevent loss of transducers because of a failed wire splice. The tubes also should protect the vent from the transducer and reduce the amount of moisture that gets into the transducer through the vent.

Planning Documents

Study Plan 8.3.1.2.3.1.1-.6, R0. "Characterization of the Site Saturated-Zone Ground Water Flow System" was resubmitted to YMPO on May 18. YMPO forwarded the plan to OCRWM on August 21. Six comments were returned to OCRWM for further clarification of the disposition. This was done and the comments were returned to OCRWM.

NRC comment #19 on the SCP was reconsidered this month. This comment, as well as a number of related comments, questions the adequacy of the testing plan for the saturated zone. The response indicated that the USGS believes the current plan is sufficient to estimate flow paths and times considering that the saturated zone is a secondary barrier. However, the response indicated that as the conceptual model of the flow system is developed, additional testing may be indicated.

Quality Assurance

Barometer, calibrated at the USGS Hydrologic Instrumentation Facility, was returned on 8/23. It was sent to D. Baldwin to replace the barometer at USW G-3. Preliminary indications are that this barometer has lost sensitivity; it may be replaced as soon as a replacement is available.

Auditors D. Harris (YMPO) and T. Verma (NRC) visited well UE-25 WT #6 to inspect the calibration sticker and logbook. The purpose was to visit a remote site that had never been visited during a previous audit.

HP-75, R1 (measuring water levels with steel tapes) was approved by the QA office and took effect this month. There were no major changes in procedures but just a clarification of practices. This revision also brought the procedure in to compliance with current QA requirements.

Correction action report CAR-90-02 relating to transducer failures was issued. The CAR was used to formally document steps that have been taken to reduce transducer failure rate.

<u>Operations</u>

R. Luckey worked on PACS eighteen-month planning document for the Site Potentiometric Level project.

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Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.3.1.3 Analysis of single- and multiple-well hydraulic-stress tests

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

A technical poster describing the results of monitoring the hydrologic effects of periodic strain wave monitoring was displayed at the CASY symposium September 13 and 14, 1990.

The graphical well test analysis program continues to be tested by analyzing existing data sets from chole well tests. Problems with the program are being documented and will be corrected.

Writing of the c-hole intraborehole flow and hydraulic stress test report has continued. A detailed annotated outline has been expanded and analysis of several of the previously completed tests has been finished.

The c-hole hydrogeology report is waiting for materials from R. Spengler (GD). The delivery date of this report has been set for March 31, 1991.

Three shallow neutron holes were instrumented with a differential transducer to monitor gas pressure. This data is being collected to help develop the method for obtaining pneumatic diffusivity from gas pressure measurements. Plans are made to instrument other sites, both shallow unsaturated boreholes and deep saturated zone boreholes, to refine this method.

Because the criteria letter work to remove the packers and tubing from c-holes was scheduled to begin September 17, 1990, the small packer, transducers, and strip charts that were monitoring earth tide, seismic, and barometric pressure induced fluid pressure changed in C1 were removed. The transducers were also removed from C2 and C3.

The criteria letter work was postponed on September 14, 1990, and continues to be delayed. Because the monitoring equipment has already been removed in preparation for this work, we have thus far missed data collection of the response to two underground nuclear explosions and one earthquake.

Plans are now underway to instrument UE-25b #1 and US H4 with small packers, transducers, and strip charts to monitor for seismic, barometric, and earth tide responses.

Carry-over from Fourth Quarter: Revision of the c-hole hydrogeology report is dependent upon receipt of materials from Rick Spengler.

Planning Documents

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There were no responses required for comments to the statutory SCP.

The study plan awaits DOE approval.

Ouality Assurance

No activity on software QA pending final resolution of QMP 3.03 and the availability of personnel.

J. Gemmell and G. Patterson completed all required QA readings.

Operations

No recruitment activity was initiated for the GS-7 hydro-tech position. This position is required to

address software QA.

Recruitment continues for a GS-13 hydrologist to replace D. Galloway as activity chief.

Changes in Future Plans (Plans not described in Work Plan)

SCP 8.3.1.2.3.1.4 Multiple-well interference testing

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

J. Sharman attended design coordination meetings with the USGS for the Saturated Zone Packer System.

USBR received technical questions on the packer solicitation for the downhole instrument.

The graphical well test analysis program continues to be tested by analyzing existing data sets from chole well tests. Problems with the program are being documented and will be corrected.

Construction of the two "prototype" packer strings has not begun. We continue to hold weekly meetings with USBR to monitor the requisitioning of equipment and supplies. About 90% of the materials needed for construction has been ordered.

Major problems were discovered with the request for bids submitted by BOR for requisition of the packers. The deadline was moved back three weeks to allow time for a more specific description of needs.

G. Patterson and K. Karasaki have continued setting up preliminary models of the c-hole complex to test various conceptual models and help design the packer testing program.

Carry-over from Fourth Quarter: The joint DOE/AECL proposal has been approved by DOE and awaits final approval from AECL.

Planning Documents

There were no responses required for comments to the statutory SCP.

The study plan awaits DOE approval.

Quality Assurance

USBR continued design drawings for the Saturated Zone Packer System.

There has been no activity on software QA pending final resolution of QMP 3.03 and the availability of personnel.

There have been no packer string QA activities due to ongoing design of the equipment.

There has been no QA activity relative to the c-hole hydraulic testing because of packer string design delays.

J. Gemmell and G. Patterson completed all required QA readings.

Operations

J. Boernge met with J. Gemmell and G. Patterson concerning the packer solicitation. The group decided to amend the solicitation bid date to October 26 and revise the specifications by October 5th.

A Campbell CR-7 data logger that will be used during multiple well testing at the c-holes was received and bench testing was begun.

Changes in Future Plans (Plans pot described in Work Plan)

SCP 8.3.1.2.3.1.5 Testing of the C-hole sites with conservative tracers

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

No further development on analysis techniques for C-hole tracer tests. We will evaluate TRINET and FEHMS for use in test analysis. These methods require fracture information that will be obtained from cross-hole seismic surveys.

The c-hole cross-hole seismic surveys were delayed by delays in removing the tubing and packers currently in the c-holes. This work has now been delayed again.

Work has begun to construct preliminary solute transport models to test conceptual models and provide input for tracer test design. Both TRINET (LBL) and FEHMS (LANL) will be set up using fabricated data sets until better data becomes available.

Design of the tracer injection system to be interfaced with the multiple zone packer system has been completed and purchasing of the required components has begun.

Planning Documents

There were no responses required for comments to the statutory SCP.

The study plan awaits DOE approval.

Quality Assurance

No activity on software QA pending final resolution of QMP 3.03 and the availability of personnel.

J. Gemmell and G. Patterson completed all required QA reading.

Operations

4

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

Carry-over from Fourth Quarter: A formal request for a fourth c-hole is still being put together by G. Patterson and B. Robinson. This borehole will be drilled approximately 25 degrees from vertical and will be cored from 100 feet above the water table to the bottom. It will be about 3,300 feet in total length and 3,000 feet deep. It will be located north of UE25-C#1 about 500 feet.

REECO's cost estimate for the additional borehole is roughly \$800 per foot with a total cost of about \$3,000,000.

WBS 1.2.3.3.1.3.2 Saturated Zone Hydrochemistry Principal Investigator - W. Steinkampf

OBJECTIVE

To describe spatial variations in chemical composition of ground-water; to identify chemical and physical processes that influence ground-water chemistry; to use hydrochemical data to aid in the identification and/or quantification of ground-water travel times; flow paths; fluxes to, from, and within the saturated zone; and climatic conditions during past periods of recharge. (SCP Study 8.3.1.2.3.2)

SCP 8.3.1.2.3.2.1 Assessment of saturated-zone hydrochemical data availability and needs

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Spoke with (called by) M. Gascoyne re: apparent progress in plans to test the downhole hydrochemical tool in Canada. Gascoyne indicated that he was in process of re-reviewing the proposal. No word to date from DOE on the activity.

Attendance at Dionex training course delayed by later-than-planned order and receipt of equipment. Familiarization with equipment continued.

Ordered and received laboratory glassware and electrical power conditioners for microcomputer and ion chromatograph system uses.

<u>Planning Documents</u> Provided input to W. Dudley re: NRC comments on statutory SCP.

<u>Ouality Assurance</u> Performed assigned readings and updated files.

Operations

Prepared and submitted monthly activity reports.

Prepared and submitted purchase documents for requisite capital and non-capital sample-collection equipment.

Completed PACS scheduling.

* Met with Dr. Dumke (GDR) re: extant methodologies for hazardous waste sampling and field data collection.

* Attended laboratory safety training in Lakewood, Colorado.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.1.3.3 Saturated Zone Hydrologic System Synthesis and Modeling

Principal Investigator - R. Luckey LBL Principal Investigator - K. Karasaki

OBJECTIVE

To synthesize available data to develop a conceptual model; to make a qualitative analysis of how the system is functioning; to develop and evaluate porous-media and fracture-network methods for simulating ground-water flow and solute transport; and to estimate ground-water flow direction and magnitude for input to ground-water travel time calculations. (SCP Study 8.3.1.2.3.3)

<u>SCP 8.3.1.2.3.3.1</u> Conceptualization of saturated zone flow models within the boundaries of the accessible environment

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

K. Turner, E. Ervin, and J. Downey wrote a draft abstract, for the American Nuclear Society conference scheduled next spring, entitled: Geoscientific Information Systems (GSIS) and three-dimensional ground-water flow modeling at Yucca Mountain, Nevada.

An informal modeling meeting was held September 11 and was attended by J. Czarnecki, J. Downey, R. Luckey, and E. Ervin. The topic of discussion was data needs for ground-water flow modeling.

E. Ervin attended the two-day CASY conference on fractures and fracture flow held September 13 and 14, and participated in a GIS demonstration of some work being done on the scale of Yucca Mountain by the paleohydrology group.

E. Ervin worked on data synthesis for the site potentiometric map using 1988 average water-level data. Data were plotted on a 1:48000 scale map along with geologic unit in which each well is completed.

Planning Documents

Study Plan 8.3.1.2.3.3, Site Saturated-Zone Hydrologic System Synthesis and Modeling was transmitted to YMP on September 4, 1990.

E. Ervin worked with D. Gillies and R. Luckey on the PACs eighteen-month plan for WBS 1.2.3.3.1.3.3 activities: conceptualization of site flow models (8.3.1.2.3.3.1) and development of the fracture-network model (8.3.1.2.3.3.2).

Ouality Assurance

Operations

<u>Changes in Future Plans</u> (Plans not described in Work Plan) Trip to the NTS to see locations of outcrops for possible fracture mapping in the Crater Flats tuff, particularly the Bullfrog member, September 26 - October 1.

SCP 8.3.1.2.3.3.2 Development of fracture network model

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

K. Karasaki and S. Martel attended the CASY symposium on "Fractures, Hydrology, and Yucca

Mountain," held in Denver on September 13 and 14, where Karasaki presented a paper entitled, "Modeling of Flow and Transport in Fracture Networks."

A paper titled, "Method Development and Strategy for the Characterization of Ground-Water Flow and Transport in Faulted and Fractured Rhyolitic Tuffs, Yucca Mountain, Nevada, USA," is being prepared for the OECD/NEA workshop.

Sources that may be used for cross-hole tomography survey at UE-25c holes were tested.

Planning Documents

Detailed FY91 work plans were made and sent to USGS.

Quality Assurance

T. Mendez-Vigo, of SAIC, visited LBL in order to take an inventory of documents to be considered for duplication.

QA reading assignments were completed by various personnel.

Operations

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.3.2 Preclosure Hydrology

OBJECTIVE

To examine hydrologic conditions, including flooding, availability of water supply, and characteristics within and above the repository horizon; and to determine whether engineering measures that require excessive cost, or technology beyond that which is reasonably available, will be needed during construction or operation of the repository. (SCP Section 8.3.1.16)

WBS 1.2.3.3.2.1 Flood Recurrence Intervals and Levels at Potential Locations of Surface Facilities Principal Investigator - P. Glancy

OBJECTIVE

To assess the flood and debris hazards at and near the potential repository surface facilities locations to allow adequate design of facilities to prevent or reduce hazards to an acceptable level. (SCP Study 8.3.1.16.1.1)

SCP 8.3.1.16.1.1.1 Site flood and debris hazards studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Maintained vigilance for rainfall and runoff during the month. An intensive, but localized, storm occurred in the Muddy River Basin (Glendale-Overton area) northwest of Las Vegas on September 18. Peak flows were documented in about a half-dozen drainages. Wet atmospheric air masses again moved into Nevada during the weekend of September 22-23: resultant rainfall at the Nevada Test Site caused some runoff, mostly believed to be minor, that is currently being investigated and documented.

Data form numerous floods during the summer are being processed and analyzed.

Current literature on flooding and related hazards was scanned and appropriate articles were duplicated

for addition to our library.

Planning Documents

The study plan for this activity is still undergoing DOE Headquarters review.

Ouality Assurance

New Quality Assurance documents (QMP updates, etc.) and new revisions to Administrative Procedures were systematically filed; records of proper filing were transmitted to senders.

Reading assignments on QA documents were done and verification of completion was mailed to YMP QA staff.

Work was continued on the myriad of formerly approved QA procedures that recently had been rereviewed for technical content. Results of the minor technical revisions required are still being finalized by M. Pabst of our QA staff.

R. Carman, a new member of the Carson City work group, underwent preliminary QA indoctrination and training in Las Vegas during the week of September 24.

Operations

There was no specific operations activity for this activity during September, 1990.

<u>Changes in Future Plans</u> (Plans not described in Work Plan) Documentation on recent regional flooding will continue during the foreseeable future.

WBS 1.2.3.6 Climatology and Meteorology

OBJECTIVE

To collect and analyze climatic, paleoclimatic, future climatic, and Quaternary hydrologic data to evaluate the suitability of the site.

WBS 1.2.3.6.2 Climatology

OBJECTIVE

To characterize the present, paleo-regional, local climate, and hydrologic conditions at Yucca Mountain, and to determine the magnitude and likely effects that future changes in climate will have on repository performance.

WBS 1.2.3.6.2.2 Effects of Future Climatic Conditions on Hydrologic Characteristics

OBJECTIVE

To determine the relations between climatic conditions and hydrologic characteristics in the vicinity of Yucca Mountain during and since the Quaternary; and to predict future hydrologic response to possible future climatic conditions. (SCP Investigation 8.3.1.5.2)

WBS 1.2.3.6.2.2.1 Quaternary Regional Hydrology Principal Investigator - J. Stuckless

OBJECTIVE

To investigate the hydraulic characteristics of paleoflood events and to compare them with modern flooding and related geomorphic processes; to determine past infiltration and percolation history at Yucca Mountain through isotopic and chemical analysis of water from the unsaturated zone; to determine past hydrologic conditions in the regional discharge area; to estimate the conditions and rates of infiltration and ground-water recharge during the Quaternary; and to determine the ages, distribution, origin, and paleohydrologic significance of calcite and opaline silica deposits along faults and fractures.

SCP 8.3.1.5.2.1.1 Regional paleoflood evaluation

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

The available newly published literature was scanned to stay abreast with changing technology in paleoflooding. Important and useful articles were copied and included in our YMP technical library.

Documentation and processing of data from numerous 1990 floods dominated technical work.

P. Glancy received technical field consultation from M. McKittrick of Geologic Division, Menlo Park, regarding her scheme of geomorphic mapping and surficial geologic knowledge of the Resting Springs and Nopah Mountain Ranges in the middle Amargosa River Basin.

Planning Documents

U.S.G.S. colleague-review comments on this activity's study plan were resolved by the author (Glancy) and the plan was returned to NHP for retyping prior to transmittal to DOE.

Quality Assurance

New Quality Assurance documents (QMP updates, etc.) and new revisions to Administrative Procedures were systematically filed; records or proper filing were transmitted to senders.

R. Carman, a new member of the Carson City work group, underwent preliminary QA indoctrination and training in Las Vegas during the week of September 24.

Operations

There was no specific operations activity during September, 1990.

<u>Changes in Future Plans</u> (Plans not described in Work Plan) Documentation of recent regional flooding will continue during the foreseeable future.

SCP 8.3.1.5.2.1.4 Analog recharge studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

A. Riggs met with H. Claassen and J. Phillips at OPCNM to help get the ³⁶Cl soil dating and soil transport work underway.

A. Riggs did the quarterly AZ precipitation sampling.

Made initial pull of QW data from NWIS and made corrections to test software.

Final Data transfer and NWIS system update will be made at the end of September. Finalization of QWDATA will take place after NWIS system is in place.

* Chloride ion leaching experiment has been discontinued because of the loss of the laboratory technician. Future work will be started as scheduling permits.

* Plant data has been postponed because personnel was not available this summer. Other projects which share personnel with the Analog Recharge project had priority.

* Evapotranspiration equipment that was scheduled to be tested was not purchased until the end of the fiscal year thus eliminating the opportunity to test in the laboratory or field. This will also delay the writing of procedures.

A field trip (21 to 28 September) to Analog sites completed by P. McKinley. Field data retrieved and equipment maintenance was completed.

Attended laboratory safety sessions.

Discussed laboratory methods and the possibility of small volume anion samples with M. Shockey of the Central Laboratory. Cost of special analysis is very high.

Rattlesnake Ridge analog site has been indefinitely postponed due to lack of personnel to operate the site.

P. McKinley attended a presentation of current surface and volume modeling and geologic modeling software which was presented by the USGS and two vendors.

W. Talbot completed second plotting of slope, aspect, and elevation of the analog sites.

Planning Documents

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A. Riggs provided detail for the PACS Summary Accounts and modified the PACS input to reflect more closely what we are doing.

Ouality Assurance

A. Riggs read SPs 6.17, R0; 6.43Q, R0; 6.4Q, R0; and 5.28Q, R0.

P. McKinley was contacted by J. Ziemba (SAIC/Golden) on QA questions and D. Valega (SAIC/Golden) about certification of LiCor.

P. McKinley attended a meeting on new draft of QMP-3.03, R3.

Operations

A. Riggs arranged to meet with tower installation contractor at Organ Pipe Cactus, New Mexico; met with contractor for OPCNM; arranged for storage of incoming equipment that's too long to fit through the doorway.

A. Riggs arranged for technical modifications on some anemometers so that they can collect the amount of data we need without bogging down.

PACS analysis was completed.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

SCP 8.3.1.5.2.1.5 Studies of calcite and opaline silica vein deposits

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

J. Stuckless submitted a draft of "An Evaluation of Evidence Pertaining to the Origin of Vein Deposits Exposed in Trench 14, Nevada Test Site, Nevada" to the DOE and the ANS for next spring's High Level Nuclear Waste Conference.

J. Stuckless, J. Whelan and W. Steinkampf submitted a draft of "Isotopic Discontinuities in ground water Beneath Yucca Mountain, Nevada" for presentation at the next High Level Nuclear Waste Conference. They started working on presenting results to the next informal CASY seminar.

J. Stuckless, Z. Peterman, and J. Whelan spent two days at the Sample Management Facility selecting drill core from holes USW G1, G2, and G3 to request for isotopic analysis.

J. Whelan continued analyzing standards on a mass spectrometer that has recently been repaired to bring the machine back into calibration prior to restarting analysis of YMP samples. The stable isotope chemistry lab is currently down because of construction in the chemical wing of the building.

Z. Peterman continued analysis of samples from the Crater Flats area and started work on water samples from the Ruby Mountains.

J. Stuckless participated in a DOE field trip planning meeting for the National Academy of Sciences field trip which is scheduled for mid October.

G. Cebula continued work on mineral separations for calcite from the Crater Flats localities in preparation for U-series dating of these deposits.

Problems: All of the isotope laboratories are working at reduced capacity or shut down temporarily by installation of a new air handling system in the chemistry wing of Bldg. 21. Construction is scheduled for September through November.

Planning Documents

Quality Assurance

Yearly balance calibrations have been completed for all of the isotope labs. Technical procedures are being revised to permit in-house calibration of balances with NIST certified weights.

Operations

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

WBS 1.2.3.6.2.2.2 Future Regional Hydrology due to Climate Changes

Principal Investigator - J. Stuckless

OBJECTIVE

To characterize the impacts of potential future climate changes on the regional and site surface-water system, the site unsaturated zone hydrology, and the regional and site saturated zone hydrology. (SCP Study 8.3.1.5.2.2)

SCP 8.3.1.5.2.2.1 Analysis of future surface hydrology due to climate changes

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Drainage areas for active and proposed stream gauges were digitized for use in hypothetical runs of watershed models. These runs will assess the data needs, accuracy, and applicability of the PRMS watershed model.

Planning Documents

Ouality Assurance

R. Carman, a new member of the Carson City work group, underwent preliminary QA indoctrination and training in Las Vegas during the week of September 24.

Operations

R. Carman was added to the project to assist in operations and quality assurance.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.3.7 Resource Potential

<u>OBJECTIVE</u>

To determine present and future resource potentials at the repository site and surrounding area; to determine the likelihood of inadvertent human intrusion into a mined geologic disposal system; and to determine the possible consequences of interference. (SCP Program 8.3.1.9)

WBS 1.2.3.7.2 Present and Future Value of Resources

OBJECTIVE

To evaluate the natural resource potential and its future economic importance at Yucca Mountain. (SCP Investigation 8.3.1.9.2)

WBS 1.2.3.7.2.1 Natural Resource Assessment

Principal Investigator - J. Bergquist

OBJECTIVE

To identify and assess the mineral and energy resource potential at the proposed repository site at Yucca Mountain; to conduct a geochemical sampling program for precious, base, strategic metals, energy resources, and industrial minerals; and to assess the potential for geothermal energy and hydrocarbon resources and the potential for undiscovered resources and future exploration. (SCP Study 8.3.1.9.2.1)

SCP 8.3.1.9.2.1.2 Geophysical/geologic appraisal of the site relative to mineral resources

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

In addition to 13 reports worked on at various stages of publication, H. Oliver prepared 25 color viewgraphs and presented these new data to the National Academy Committee on Hydrologic Models on July 28, 1990, including color copies to the 15 member committee. Oliver also represented YMP geophysical studies at the Swedish-U.S. exchange meetings in Stockholm and Aspo on August 14 through September 2, 1990, where he gave a 2-hour lecture summarizing the major geophysical results of the YMP.

Planning Documents

Ouality Assurance

Operations

Changes in Future Plans Plans not described in Work Plan)

1.2.5 REGULATORY AND INSTITUTIONAL

OBJECTIVE

To support the Department of Energy (DOE)/HQ in the development of the site-related aspects of compliance with Nuclear Regulatory commission agreements, requirements, and policies, environmental and permitting requirements, and related DOE orders, and the development of site-related regulatory documentation; to plan and conduct environmental field investigations and transportation studies related to environmental compliance, permitting and repository design; to plan and conduct socioeconomics studies to assess the regional socioeconomic action studies; to coordinate Project activities with the community and state and local governments; and to plan and implement a public communication plan.

WBS 1.2.5.2 Licensing

OBJECTIVE

To support DOE by providing Project coordination and support of NRC interactions by providing input related to site aspects of proposed NRC regulation changes, and evaluate the impact of the regulation changes on the site activities, strategies, and plans; to support DOE/HQ in the development of site technical position papers by synthesizing site and site performance assessment technical information into Project positions; to develop draft position papers which support these positions; to perform technical evaluation of site data and related reports, technical reports, and conclusions, and draft position papers; to coordinate study plan review; to support the preparation of the semi-annual progress report for site investigations and assessments; and to coordinate and perform technical reviews of the site characterization program.

WBS 1.2.5.2.5 Study Plan Coordination

Principal Investigator - L. Hayes

OBJECTIVE

To coordinate the preparation review and revision of SCP Study Plans.

ACTIVITIES AND ACCOMPLISHMENTS

S. Keller assisted W. Causseaux in the PRIMAVERA update for three NHP study plans: 8.3.1.2.2.9, 8.3.1.5.2.1, and 8.3.1.5.2.2.

F. Singer developed a logic diagram summarizing the seismicity program (Investigation 8.3.1.17.3 and Study 8.3.1.17.4.1) and respective interfaces.

Computer assistance in support of study plan development continued with programming and data entry to support both study-plan production and the efforts on comment-response packages for study-plan reviews.

Pre-YMP-Submittal Study Plans

Study Plan 8.3.1.2.2.8 (Fluid flow in unsaturated, fractured rock) - J. Weaver and S. Keller recompiled the study plan to incorporate NHP QA and Branch QA reviews. The study-plan transmittal to the Project Office for DOE review was on September 7.

Study Plan 8.3.1.2.3.3 (Site saturated-zone hydrologic system synthesis and modeling) - S. Keller recompiled the study plan to incorporate NHP QA and Branch QA reviews. The study-plan transmittal to the Project Office for DOE review was on September 4.

Study 8.3.1.5.2.1, R1 (Quaternary regional hydrology) - S. Keller recompiled the study plan to reflect author/reviewer concurrence, transmitted it for NHP QA and Branch QA reviews, and recompiled it to incorporate the reviews. The study-plan transmittal to the Project Office for DOE review was on September 25.

Study 8.3.1.5.2.2 (Effects of climate on hydrology) - S. Keller recompiled the study plan to reflect the August 15 PI meeting on future saturated-zone hydrology, and transmitted it to J. Stuckless September 7. A second recompilation was then done to incorporate his new input, and turned back to him September 18 for final input from the Sec. 3.3 authors. On September 28, J. Stuckless and S. Keller finalized the content of the author draft for transmittal for technical review.

Post-YMP-Submittal Study Plans

Study Plan 8.3.1.2.1.3 (Regional ground-water flow system) - S. Keller recompiled the study plan to incorporate the proposed dispositions from the comment resolution workshop (CRW), and (as the author's delegate) completed and indexed the actual dispositions on the comment resolution forms (CRFs). The study-plan transmittal to the Project Office for DOE audit review was on September 17, and transmittal of CRFs was on September 19.

Study Plan 8.3.1.2.2.1 (Unsaturated-zone infiltration) - J. Weaver attended the CRW in Las Vegas September 11-12, recompiled the study plan to incorporate the proposed dispositions from the CRW, and (as the author's delegate) completed and indexed the actual dispositions on the CRFs. The studyplan transmittal to the Project Office for DOE audit review was on September 18, and transmittal of the CRFs was on September 19.

Study Plan 8.3.1.2.2.6 (Gaseous-phase circulation study) - S. Keller worked with SAIC-Las Vegas personnel to finalize the author responses to outstanding items from the DOE audit review, in preparation for final transmittal of the study plan to the Project Office.

Study Plan 8.3.1.2.3.1 (Site saturated-zone ground-water flow) - J. Weaver assisted D. Luckey in preparing author responses to outstanding items from the DOE audit review, and transmitted the
responses to SAIC-Las Vegas for DOE concurrence.

Study Plan 8.3.1 5.4.4 (Analysis of the paleoenvironmental history of Yucca Mountain) - F. Singer finalized responses pertaining to sections 1, 4, and 5 of YMP-OCRWM comments, in preparation for a comment resolution workshop scheduled for October 9, 10, and 11 in Denver, Colorado.

Study Plan 8.3.1.17.4.10 (Geodetic leveling) - F. Singer finalized responses to sections 1, 4, and 5 of YMP-OCRWM comment resolution forms in preparation of the comment resolution workshop. The workshop was held on September 19 in Denver, Colorado.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

1.2.9 PROJECT MANAGEMENT

OBJECTIVE

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To provide overall management of the Yucca Mountain Project including: project control, quality assurance, technical integration, and interaction with other OCRWM Program demands on Project management activities.

WBS 1.2.9.1 Management and Integration

OBJECTIVE

To provide overall management of the Yucca Mountain Project including: technical integration and interaction with other OCRWM Program elements.

WBS 1.2.9.1.1 Management

Principal Investigator - L. Hayes

OBJECTIVE

To provide overall management of the Yucca Mountain Project including budgeting and financial analysis, progress reporting, support to HQ management activities, training, and overall Project integration.

ACTIVITIES AND ACCOMPLISHMENTS

Reading Assignments were distributed to assigned personnel for QMP-5.01, R4 Preparation of Technical Procedures, and QMP-17.01, R4 YMP-USGS Records Management.

Third Reading Assignment Reminder Notices were distributed to participants who were late in submitting completed forms for QMP-3.04, R3. A first reminder notice was distributed to participants who were late in submitting completed forms for the APQs reading assignment that was issued in August. Work continued with Geologic Division and Nuclear Hydrology Program Implementation Specialists to secure completion of reading assignments due before the June 1990 DOE 90-03 Audit. Overdue reading assignment information was also provided to the TPO QA Advisor for distribution during Action Items meetings and to the TPO for his recommendations as to what further action.

Orientation video tape assignments and reading assignments were distributed to new personnel per management's requests.

Updated preliminary drafts for training procedures QMP-2.07, R1 and QMP-2.08, R1 were presented to T. Chaney, USGS, for his review and comments.

Instruction database entries and dual storage filing were completed for all participants received

in September.

The Training Specialist represented the USGS at the YMP Training Coordinators' Meeting in Albuquerque, New Mexico, on 9/18-19/90. Those attending received instruction for the new DOE Environment Requirements Training Program (ERTP). Because of this instruction, the Training Specialist is now considered qualified to present the course to YMP-USGS participants.

A draft of the August Quality Assurance workshop notes were prepared for Martha Mustard, USGS.

The USGS Audit of Criterion 2 was assisted by providing requested instruction assignments and course materials.

A Group Facilitator workshop was attended by the Training Specialist.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.9.1.4 Records Management

Principal Investigator - L. Hayes

OBJECTIVE

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To provide a Yucca Mountain Project Records Management System that will meet the requirements of: DOE-NNWSI, Quality Assurance Plan, DOE-NNWSI/88-9; DOE-OCRWM Records Management Policies and Requirements, DOE/RW-0194; and the Licensing Support System (LSS); and to establish and operate all local records centers.

ACTIVITIES AND ACCOMPLISHMENTS

Informal discussions with the Project Records Manager related to the resources required to implement the new records management requirement that "records must be retained in a one-hour fire-rated container until submitted to the LRC" were conducted on behalf of the TPO.

Conducted the records management reviews and comments of QMPs -3.07, R4, -4.01, R4, -4.02, R2, and -7.01, R4.

Prepared an extension request for NCR-90-27 which included an expansion to cover all Study Plans residing in the LRC which have not been formally processed to the CRF.

Provided LRC service during the one week YMP/DOE Surveillance and the two week YMP-USGS Audit.

Provided additional input to the TPO Office for amended responses to SDRs which resulted from the DOE/YMP Audit 90-04.

C. Sellards, T&MSS, visited the LRC September 11 and 12 to work with the LRC staff to evaluate the effectiveness of Project records management processes and to provide recommendations for improved methods of processing YMP-USGS records for both the LRC and the Central Records Facility. The interchange of information was extremely beneficial with a proposed improved method of indexing YMP-USGS records at the Central Records Facility as a result.

L. Gron, T&MSS, visited the LRC and Records Coordinator September 19-21 to review the USGS proposed implementation of the Project Records Management Plan and to view the present operational processes. Her review of our proposed procedures QMPs -17.01, and -17.03 and her observation of

present processes identified only minor corrections which will be reviewed and implemented as appropriate. Her overall impression was extremely positive to the point that she was returning to T&MSS with recommendations to implement some of our processing methods for the LRC at T&MSS.

A CAR (YMP-USGS-CAR-90-05) was prepared and submitted to the QA Office which identified that the LRC activities temporarily would not be covered by a QMP because of the lag time between the effective date of September 24 for QMP-17.01, R4 and the approval of newly prepared QMP-17.03, R0. QMP-17.03 covers the LRC requirements.

SAIC/Golden has received the approved letter agreement for YMP-USGS Audit Finding Report (AFR) Observation - 9010-01 from Securities Archives of Denver. This action should close YMP-USGS-AFR-90-10.

Open-File I Map 2049 was received and technical data was received for open-file publications 89-234, 89-595 and I Map 2049.

Two submittals of publication packages (584 pages), six submittals of records and record packages (2,576 pages), and one submittal of Cited References (58 pages) were shipped to the CRF.

Continued Quality Verification Check (QVC) corrective activities associated with SDR 416.

Quality Verification Check activities were completed for QA records and QA record packages dated May 3 through August 21, 1989 as required by DOE/YMP SDR 416. This activity was completed by the expenditure of some scheduled overtime for the LRC staff.

The LRC has a "backlog" of newly received record packages because personnel resources were dedicated to the SDR 416 activities and assistance for DOE and USGS audits and surveillances. A letter was sent to C. Carpenter, Project Records Manager, per Section B.2.3 Item 7 of the Project Records Management Plan, which identified that the YMP-USGS was unable to process newly received record packages in a timely manner.

Coordination of the development of the Records tracking database system has occurred. Updating of peripheral database files is continuing to allow for timely input of data into the new system. All previously indexed records data has been converted to the new format. Approximately ten new or expanded features have been added to this system since initial implementation in August. Among them are the following:

- o Default field values which vary with user.
- o Peripheral file updating capability.
- o Record page-up and page-down in multiple orders.
- o Increased speed in record package selection.
- o Field information retention
- o Improved LRC prompting
- o Improved overall search capability
- o Refined list search capability

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

WBS 1.2.9.2 Project Control Principal Investigator - L. Hayes

OBJECTIVE

To provide Project management support in the areas of cost and schedule planning and control; to develop and maintain an integrated project management system; to implement performance measurement; to support the change control system; and to establish WBS.

ACTIVITIES AND ACCOMPLISHMENTS

The schedule update exercised started in August. The 18 month detail was merged with the LRP and the internal interfaces connected. Level I and II milestones were located. All master schedules have been sent to Las Vegas and have been combined with other schedules for the Yucca Mountain Project in the APECS system. This was accomplished with minor corrections in Las Vegas.

An 18 month look ahead schedule report was generated for the PI's use in expanding the descriptions items in the schedule.

All of the GD schedules have been cleaned up and plotted on 11 x 17 plots with a bar chart included for the PI's use in resource loading.

There are approximately 6,000 items in the APECS system, of which 3,200 are USGS-YMP activities.

The SAIC-YMP actual cost distribution for August, the estimated cost distribution for September, the September FTE report, and the USGS September cost report were compiled. The compilation of the USGS monthly status report for August was completed and the report was edited and submitted to DOE.

USGS summary accounts were compiled and given numbers for the PACS system.

Programs were written to provide data entry and printing of PACS Summary Account forms. The data were captured in dBASE files on the SAIC Novell network to facilitate the editing of the input data. A program was written and tested to output the dBASE data in flat file structures that can be directly imported into the PACS INGRES database when final editing is complete.

Bureau of Reclamation FY90 estimated underruns were reported to USGS. A total underrun of \$85,000 under WBS 1.2.3.3 resulted from instrumentation specifications decision delays. The delays affected planned procurements for materials and assembly services.

L. Roadway transmitted the GD August accounting reports; processed GD YMP procurement documents; and worked on a capital equipment procurement tracking system for WRD.

<u>Changes in Future Plans</u> (Plans not described in Work Plan)

WBS 1.2.9.3 Quality Assurance

OBJECTIVE

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To establish and implement a Yucca Mountain quality assurance program.

WBS 1,2,9,3,1 Quality Assurance Program Development

Principal Investigator - D. Appel

OBJECTIVE

To establish and maintain the QA program descriptions.

ACTIVITIES AND ACCOMPLISHMENTS

J. Kinney presented an indoctrination overview on project quality assurance to incoming USBR TPO, D. Campbell. More training and reading assignments have been scheduled.

J. Kinney met with G. Serpa, B. Pritchett, and L. Marquez of the USBR Information Systems Branch. They presented an update of their Project Plan for completing and implementing a software quality assurance program for software development.

J. Prizio (a) conducted training for USBR staff on certifying existing software for Yucca Mountain Project use; (b) revised a QMP for certifying existing software to incorporate USGS review comments; and (c) updated training materials after revising a QMP for certifying existing software.

Participated in the internal audit on September 18 regarding QMP-3.04.

Reviewed drafts of QMP-3.07, R4, and QMP-17.03, R0 and submitted comments to the TPO.

Reviewed modification 1 for QMP-3.04.

Discussed recent Project Office request regarding AP-6.1Q with T. Chaney on September 20. The AP appears to conflict with AP-1.3Q. Recommended that publications be exempt from AP-6.1, because AP-1.3 specifically covers publications. Chaney to follow up on issue.

QMP-17.01, R4, YMP-USGS Records Management, was approved and distributed. QMPs -3.14, R3 and -4.02, R2 were approved by both the YMP-USGS TPO and QA Manager and forwarded for other management signatures on September 19.

The author has responded to all comments received for QMP-17.03, R0, YMP-USGS Local Records Center, and rejected comments have been returned to the reviewers for concurrence. Division review comments for QMP-12.01, R5, Instrument Calibration, have been received and are with the author for comment resolution. Comments have been received from the records coordinator, TPO support and GD for the following QMPs: QMP-3.07, R4, -4.01, R4, -7.01, R4. A comment resolution meeting has been scheduled for QMP-5.05, R2 for October 5. QMPs -2.02, R4, -2.07, R1, -2.08, R1 and -3.04, R4 are currently in preparation. Additionally, as a result of the internal audit of the YMP-USGS, the following QMPs will be revised: QMPs -15.01, R5 and -16.03, R3.

Thirty-one records packages were completed for superseded and deleted Quality Management Procedures from May 3, 1989 to the present, to satisfy the YMP-USGS Records Center commitment to submit these packages to the Central Records Facility by October 1, 1990. Additionally, six technical procedure packages and two QMP packages were prepared and submitted to the YMP-USGS LRC.

The Software Quality Assurance (SQA) Committee met to review the draft of QMP-3.03, R3, Software Quality Assurance. Coordination of the committee's efforts continue, including attendance at subsequent meetings to revise the draft. Briefings for the TPO and QA staff to report the status of draft QMP-3.03, R3 were held. A copy of a QARD software requirements matrix was prepared to confirm compliance with the projected QA requirements.

Progress was made in the preparation of a YMP-USGS QA Grading Procedure. The Procedure is currently being tested for understandability for implementation.

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.9.3.2 Ouality Assurance - Audits and Surveillances

Principal Investigator - D. Appel

OBJECTIVE

To verify the QA program through periodic audits and surveillance of Project activities.

ACTIVITIES AND ACCOMPLISHMENTS

J. Kinney served on the USGS internal audit team for Quality Assurance Audit USGS-90-13 from September 6-21. Kinney's general areas of responsibility were QMP-4.01, QMP-7.01, and AP-5.19Q.

The responses to the findings and observations from Audit USGS-90-09 were evaluated and accepted.

Audit USGS-90-13 was conducted September 10-21 and included auditing of the following criteria:

QMP-3.04	QMP-3.10	QMP-3.13	QMP-5.02	QMP-16.03
AP-6.2Q	AP-6.3Q	AP-6.4Q		

QA Audits for vendor annual regualifications were conducted:

o YMP-USGS-90-14, Sverdrup

o YMP-USGS-90-15, Intertyme Metrology, Inc.

o YMP-USGS-90-16, EG&G Geometrics, Inc.

A Special Investigative Review is still being conducted regarding the verification of NCR 90-25. This should be completed by early October.

Coordination continued in preparation for participating as an auditor covering NQA-1-1989 Criteria 15, 16 and 18 in the DOE/YMP qualification (Gold Star) audit, scheduled to begin October 15. Copies of the Lead Auditor Qualification Record for A. Whiteside were provided on September 20. The audit checklist for the Headquarters portion of the audit was completed and turned over to the Lead Auditor. The remaining Project Office checklist was subsequently sent to the Las Vegas office.

The QA Advisor to the TPO assisted in the coordination of the DOE/YMP Surveillance SR-90-038 that involved NQA-1-1989 Criteria 4 (procurement), 12 (calibration, 15 (nonconformances) and 16 (corrective actions). The surveillance team exited on September 13, reporting that no deficiencies were found. The surveillance team members closed six SDRs. Additional discussions were held concerning SDRs 554-561, 489 and 416. The USGS sent two people to Las Vegas during the week of September 17 to continue discussions and agree upon resolutions for these SDRs. The meetings were held, but some of the key DOE/YMP audit personnel were unable to attend. Agreements upon resolution were reached for SDRs 554, 555, 557, 558, 559 and 561. Later telephone conversations were needed to reach agreement for SDRs 556, 560, 489 and 416. The preparation of amended responses or status updates are needed for all of these SDRs.

The supplemental response to Observation 1 from Surveillance USGS-90-S30 was accepted and the subject surveillance closed. Surveillances USGS-90-S29 and USGS-90-S36 were closed out and surveillance record packages were submitted to the Local Records Center.

Favorable vendor qualification surveillance reports were submitted to the QA Office for YMP-USGS-S34, Scott Specialty Gases, Inc., and for YMP-USGS-S35, Air Products and Chemicals, Inc.

A Surveillance Report USGS-90-S37 on the implementation of QMP-12.01, Control of M&TE was drafted. Two Nonconformance Reports were written as a result of this surveillance.

Corrective Action Report YMP-USGS-CAR-90-04 was written to document late and untimely actions relating to deficiency documents.

A Special Investigative Review Report was written concerning verification of Nonconformance Report USGS-NCR-90-20.

D. Valega is now qualified as a QA Lead Auditor for vendor audits. He also attended a "Supplier Certification Process" course sponsored by the American Society for Quality Control (ASQC).

Changes in Future Plans (Plans not described in Work Plan)

WBS 1.2.9.3.4 Quality Assurance - Quality Overview Principal Investigator - D. Appel

OBJECTIVE

To provide reviews, analysis, and interpretations of QA requirements and application of QA to technical and scientific disciplines.

ACTIVITIES AND ACCOMPLISHMENTS

The August Open Items and Trend Analysis Report was prepared with no new or potential adverse trends being identified.

The Status of Open Items Report was produced for the Open Items Status meetings held in September.

Changes in Future Plans (Plans not described in Work Plan)