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SUBJECT: U.S. Geological Survey (USGS) Detailed Monthly Status Report for June, 1993

Dear Carl:

Enclosed is the USGS detailed monthly status report for June, 1993. The format has been modified slightly to eliminate redundant titles, objectives, etc., to provide greater visibility of monthly accomplishments and work performed. If you have any questions or comments, please contact Raye Ritchey at 303-236-0517.

Sincerely,

Raye E. Ritchey

for
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329

- DIVISION
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- CC: *Lorri - w/o*
- CC: *Dixie / DIXON*
- CC: *Schredingast*
- CC: *Brodsky / PIB BC*
- CC: *Jynas / Stucker*
- CC: *Wallace - HQ*
- CC: *Gertz / L. Smith - w/o*

Attachment

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PDR WASTE
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ENCLOSURE 7

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LRH/RER/mt
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Department of the Interior
United States Geological Survey
YUCCA MOUNTAIN PROJECT
Monthly Highlights and Status Report
JUNE 1993

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

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
ACSR	Activity Control Specification Report
ACS	American Chemical Society
ACWP	actual cost of work performed
ADN	Affected Document Notice
ADP	automated data processing
ADTS	Automated Data Tracking System
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
ALARP	as low as reasonably possible
ALTS	Apache Leap Tuff Site
AMA	Assistant Manager for Administration
AMFM	alternative means of financing and managing
AML	Arc Macro Language
AMP	Administrative Management Procedure
ANS	American Nuclear Society
ANSI	American National Standards Institute
ANSTO	Australian Nuclear Science and Technical Organization
AO	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 Society for Testing and Materials
AT	acoustic televiewer
ATC	Asynchronous Terminal Concentrator
ATLAS	Alternatives to License Application Strategies
ATS	Activity Tracking System
AVL	Approved Vendors List
AVS	Application Visual System
BA	Biological Assessment
BAC	budgets at completion

BAMG	Branch of Atlantic Marine Geology
BBC	British Broadcasting Company
BBS	Bulletin Board System
BCWP	budgeted cost of work performed
BCWS	budgeted cost of work scheduled
BDR	Basic Data Recorder
BFD	Basis for Design
BG&H	Bond Gold and Hydrosearch
BGRA	Branch of Geologic Risk Assessment
BIG	Branch of Isotope Geology
BLM	Bureau of Land Management
BP	before present
BPA	blanket purchase agreement
BPO	blanket purchase order
BPG	Branch of Petroleum Geology
BQA	Branch of Quality Assurance
BRC	below regulatory concern
BRG	Branch of Central Regional Geology
BSP	balanced cross section modeling program
C/SCR	Cost and Schedule Change Request
C&C	consultation and cooperation
CA	Construction Authorization
CADD	Computer-Aided Drafting 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
CCB	Change Control Board
CCC	Configuration Control Committee
CD	Consultative Draft
CDP	Career Documentation Profile
CDR	Conceptual Design for the Repository
CFR	Code of Federal Regulations
CFS	cubic feet per second
CGC	Center for Geoscience Computing
ChemTrec	Chemical Transportation Emergency Center
CHLW	commercial high-level waste
CIRF	Configuration Identification Request Form
CMR	Branch of Central Mineral Resources
COB	close of business
COCORP	Consortium for Continental Reflection Profiling
CODMU	Computer Operations and Data Management Unit
COGS	Computer-Oriented Geological Society
COSIM	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
CSI	Campbell Scientific, Inc.
CSM	Colorado School of Mines
CVO	Cascade Volcanoes Observatory
CWP	Center for Wave Phenomena
CY	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
DECUS	Digital Equipment Corp Users Group
DEIS	Draft Environmental Impact Statement
DFC	Denver Federal Center
DHLW	defense high-level waste
DISA	Downhole Instrument Station Apparatus
DMS	Desktop Mapping System
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
DRC	Document and Records Center
DRI	Desert Research Institute
DRMS	Data Records Management System
DRS	document review sheet
DTN	document transmittal notice
DTP	Detailed Test Plan
DWMD	Defense Waste Management Department (REECo)
DWPF	Defense Waste Processing Facility
DVNM	Death Valley National Monument
EA	Environmental Assessment
EAC	estimate at completion
EAEG	European Association of Exploration Geophysicists
EBS	engineered barrier system
ECD	electron capture detector
ECR	Engineering Change Report
EDBH	engineered design borehole
EDF	Environmental Defense Fund
EDM	Equivalent Discontinuum Model
EDXRF	energy-dispersive x-ray fluorescence
E EI	Edison Electric Institute
E EP	Emergency Evaluation Plan
E FAP	Environmental Field Assessment Plan
E IA	Emergency Information Administration
E IS	Environmental Impact Statement
E KES	Electronic Keyed-Entry System

EM	electromagnetic
EMP	electron-microprobe
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERC	Engineering Request Change
ERDA	Energy Research and Development Administration
EROS	Earth Resource Observatory System
ERTP	Environment Requirements Training Program
ES	exploratory studies
ESF	Exploratory Studies Facility
ESF/DRD	Exploratory Studies Facility Design Requirements Document
ESR	electron spin resonance
ESSE	Early Site Suitability Evaluation
ESTC	Exploratory Studies Test Coordination
ESTP	Exploratory Studies Test Plan
ESTP-C	Exploratory Studies Test Plan Committee
ET	evapotranspiration
EV	earned value
FEHMS	Finite Element Heat Mass and Stress
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FFS	Federal Financial System
FFT	Fast-Fourier Transform
FID	Flame Ionization Detector
FIS	Federal interim storage
FITS	Facilities Important to Safety
FMMG	Fracture Matrix Mesh Generator
FMN	Fortymile neutron
FOLD	Federally Owned Landsat Data
FP	final procedures
FPC	final procurement and construction
FQI	Federal Quality Institute
FR	Federal Register
FRD	Functional Requirements Document
FRHP	Fractured Rock Hydrology Program
FSU	Florida State University
FTE	full-time equivalent
FWP	field work proposal
FY	fiscal year
GAO	Government Accounting Office
GAP	Geostatistical Analysis Package
GC	gas chromatograph
GCM	Global Climate Model
GCP	Geochronological Procedure
GD	Geologic Division
GEMLink	General Electric Microwave (communications) Link
GEOEAS	Geostatistical Environmental Software
GET	General Employee Training
GETT	grants equal to taxes
GID	Ground Water Site Investigation
GIS	Graphic Information System
GIT	Geochemistry Integration Team

GMP	Geologic Modeling Program
GMS	Geoscience Modeling System
GMT	Greenwich Mean Time
GOCO	government-owned contractor-operated
GOES	Geostatistical 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
GSP	Geologic Studies Program
GTUF	G-Tunnel Underground Facility
GW	ground water
GWE	Gigawatts Electrical
GWTT	ground water travel time
GXP	Geochemical Procedure
HIP	Hydrologic Investigations Program (formerly NHP)
HITF	Hydrology Integration Task Force
HLRW	high-level radioactive waste
HLRWM	High-Level Radioactive Waste Management
HLW	high-level waste
HP	Hewlett Packard
HP	Hydrologic Procedure
HQ	Headquarters
HRF	Hydrologic Research Facility
HRMP	Hydrology and Radionuclide Migration Program
HRU	hydrologic-response unit
HSPF	Hydrological Simulation Program
IBM	International Business Machines
IC	ion chromatograph
ICE	Independent Cost Estimate
ICG	International Geologic Congress
ICIAM	International Conference on Industrial and Applied Mathematics
ICN	Interim Change Notice
ICWG	Interface Control Working Group
IDAS	Integrated Data Acquisition System
IDS	Information Data System
IFS	Iterated Function System
IG	Integration Group
IGIS	Interactive Graphics Information System
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
INTRAVAL	International Transport Code Validation

IPA	Intergovernmental Personnel Act
IR	infrared
IRG	Interagency Review Group
ISA	Instrument Society of America
ISD	Information Systems Division
ISM	Interactive Surface Modeling
ISO	International Standards Organization
ITR	Information Technology Resources
IVV	Independent Verification and Validation
JGR	<i>Journal of Geologic Research</i>
LA	license application
LACT	laser alignment and centering target
LAN	local area network
LANL	Los Alamos National Laboratory
LBL	Lawrence Berkeley Laboratories
LCS	Liquid Scintillation Counter
LDRP	litigation discovery request procedure
LDS	lightning detection system
LLNL	Lawrence Livermore National Laboratory
LLP	Lightning Location & Protection, Inc.
LLW	low-level waste
LOE	level of effort
LPRS	large plot rainfall simulation
LRC	Local Records Center
LRE	latest revised estimate
LRGS	Local Read-Out Ground Station
LRP	long-range plan
LRP/IPS	Long Range Plan/Integrated Project Schedule
LRS	Litton Resource System
LSC	liquid scintillation counter
LSP	laser safety plan
LSS	Licensing Support System
LWS	Lathrop Wells aeromagnetic survey
LV	Las Vegas
MAs	Management Agreements
MADS	Meteorological Alert Distribution System
MCL	Maximum Contaminant Level
MEDA	Meteorological Data Acquisition Network
MFC	mass flow controller
MGDS	Mined Geologic Disposal System
MISIS	Micro Integrated Storm Information System
MOA	Memorandum of Agreement
MODFE	Modular Finite Element
MOU	Memorandum of Understanding
MPBH	multipurpose borehole
MPM	Management Procedure Manual
MPU	Manuscript Prep Unit
MRIR	Material Receiving and Inspection Report
MRS	monitored retrievable storage
MSA	major system acquisition
MSHA	Mine Safety and Health Administration

MSIS	Management System Information Strategy
MSL	mean sea level
MSS	Multispectral Scanner
MT	magneto-telluric
M&TE	measuring and test equipment
MTL	materials testing laboratory
mtl	main test level
MTU	metric tons of uranium
MW	mixed waste
NARUC	National Association of Regulatory Utility Commissioners
NBMG	Nevada Bureau of Mines and Geology
NBS	National Bureau of Standards (now NIST)
NCAR	National Center for Atmospheric Research
NCDC	National Climatic Data Center
NCR	Nonconformance Report
NCTM	National Computer Technology Meeting
NEA	Nuclear Energy Agency
NEPA	National Environmental Policy Act
NFS	Nuclear Fuel Services
NGS	National Geodetic Survey
NIST	National Institute of Standards and Technology
NLT	no later than
NMD	National Mapping Division
NMIMT	New Mexico Institute of Mining and Technology
NNWSI	Nevada Nuclear Waste Storage Investigation
NOAA	National Oceanic and Atmospheric Administration
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	<i>Nuclear Waste News</i>
NWPA	Nuclear Waste Policy Act
NWPO	Nuclear Waste Projects Office
NWQL	National Water Quality Laboratory
NWTRB	Nuclear Waste Technical Review Board
OBS	organization breakdown structure
OCRWM	Office of Civilian Radioactive Waste Management
OEVE	Office of Earthquakes, Volcanoes and Engineering
OFR	open-file report
OGR	Office of Geologic Repositories
OMB	Office of Management and Budget
OMR	Office of Mineral Resources
OPCNM	Organ Pipe Cactus National Monument

OPFM	Office of Project and Facilities Management
OPIO	Office of Policy, Integration, and Outreach
ORM	Office of Resource Management
ORNL	Oak Ridge National Laboratory
OSTS	Office of Storage and Transportation Systems
OWQSU	Ocala Water Quality Services Unit
P&S	planning and scheduling
PA	performance assessment
PACE	Performance Assessment Calculation Exercise
PACS	Planning and Control System
PAGEOPH	<i>Pure and Applied Geophysics</i>
PAGIS	Performance Assessment of Geological Isolation Systems
PAL	Project Acronym List
PAMP	Performance Assessment Management Plan
PAP	Performance Assessment Plan
PASP	Performance Assessment Strategy Plan
PBEI	prototype blast effects on instrumentation
PBS	pyramid beam splitter
PC	personal computer
PCBI	Prototype Controlled Blasting Investigation
PCCB	Program Change Control Board/Project Change Control Board
PCM	pivoting camera mount
PCSB	Program Cost and Schedule Baseline/Project Cost and Schedule Baseline
PC&TS	Program Coordination and Technical Support
PD	Position Description
PDA	Participant Data Archives
PDCR	prototype dry coring of rubble
PDHI	prototype drill hole instrumentation
PDM	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
PMB	Performance Measurement Baseline
PMF	probable maximum flood
PMI	Phase Measuring Interferometry
PMIS	Program Management Information System
PMP	Program Management Plan/Project Management Plan
PMR	performance measurement review
PMS	Program Management System
PNL	Pacific Northwest Laboratories
PPWE	prototype pore-water extraction
PQM	Project Quality Management
PRBP	project review briefing package
PRDA	Program Research and Development Announcement
PRESS	Project-related Engineering and Scientific Studies
PRMS	Precipitation Runoff Modeling System
PSAR	Preliminary Safety Analysis Report

PSI	pounds per square inch
PTP	Prototype Test Plan
PTS	Petroleum Testing Services
QA/QC	quality assurance/quality control
QA	Quality Assurance
QAG	Quality Assurance Grading
QAGR	Quality Assurance Grading Report
QALA	Quality Assurance Level Assignment
QALAS	Quality Assurance Level Assignment Sheet
QAM	Quality Assurance Manager
QAP	Quality Assurance Program
QAPD	Quality Assurance Program Description
QAPO	Quality Assurance Project Officer
QAPP	Quality Assurance Program Plan
QAR	Quality Assignment Records
QARD	Quality Assurance Requirements Document
QASC	Quality Assurance Support Contractor
QMP	Quality Management Procedure
QMPR	Quality Management Policies and Requirements
QRA	Quality Related Activities
QRB	Quality Review Board
QVC	Quality Verification Check
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
RASA	Regional Aquifer Study Assessment
RASRA	radial arm strike rail assembly
RCR	Regional Characterization Report
RCRA	Resource Conservation and Recovery Act
REBS	Radiation Energy Balance Systems
REECo	Reynolds Engineering and Electrical Company
RFP	Request for Proposal
RGEG	Research Grade Evaluation Guide
RIB	Reference Information Base
RIDS	Record and Information Disposition Schedule
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
RSED	Regulatory and Site Evaluation Division
RSN	Raytheon Services Nevada
RTISA	request to initiate site activity
RW	radioactive waste
RWMNFC	Radioactive Waste Management and the Nuclear Fuel Cycle
RWMS	Radioactive Waste Management Site

s-p	surface-propagated
SA	summary account
SAG	Software Advisory Group
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
SCMS	Software Configuration Management System
SCP	Site Characterization Plan
SCPB	Site Characterization Program Baseline
SDR	Standard Deficiency Report
SDRD	Subsystems Design Requirement Document
SE	Senior Engineer
SE&D	Systems Engineering and Development
SEG	Society of Exploration Geophysicists
SEM	scanning electron microscopy
SEMP	System Engineering Management Plan
SEPDB	Site and Engineering Properties Data Base
SES	Scientific and Engineering Software
SF	spent fuel
SG	Senior Geologist
SGB	Southern Great Basin
SGBSN	Southern Great Basin Seismic Network
SGR	Seismic Group Recorders
SIP	Scientific Investigation Plan
SIR	Scientific Investigations and Research
SIR	Special Investigative Review
SIT	Site Integration Team
SKB	Swedish Nuclear Fuel and Waste Management Company
SMF	Sample Management Facility
SMS	Sample Management System
SNF	spent nuclear fuel
SNL	Sandia National Laboratories
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 cell
SPR	Semi-annual Progress Report

SPR	Software Problem Report
SPRS	small plot rainfall simulation
SQA	Software Quality Assurance
SQAP	Software Quality Assurance Plan
SRD	system requirements and description
SRG	strike rail goniometer
SRM	standard reference material
SRR	Site Recommendation Report
SSF	software summary forms
SSF	specified software forms
SSR	Site Selection Report
SSSA	Soil Science Society of America
STC	Southern Tracer Complex
SWO	stop-work order
SZ	saturated zone
T&MSS	Technical and Management Support Services
T&MSS SP	T&MSS Standard Practice Procedure
TAR	Technical Assessment Review
TBD	to be determined
TBM	Tunnel Boring Method
TC	Technical Contact
TC	Training Coordinator
TCD	thermal conductivity detector
TCP	telescoping camera pedestal
TCPAL	Thermocouple Psychrometer Calibration
TDAG	Technical Data Advisory Group
TDB	Technical Data Base
TDD	Test Descriptions Document
TDF	task definition form
TDIF	Technical Data Information Form
TDR	time domain reflectometry
TDS	total dissolved solids
TEF	Test and Evaluation Facility
TESS	TRW Environmental Safety Systems
TFA	Temporary Field Assistant
TIC	Technical Information Center
TM	thematic mapper
TP	Technical Procedure
TPEC	Technical Proposal Evaluation Committee
TPO	Technical Project Officer
TPP/JPP	Test Planning Package/Job Planning Package
TPT	Testing Prioritization Task
TQM	Total Quality Management
TRIG	Technical Review and Integration Group
TRIMS	Technical and Regulatory Information Management System
TRU	Transuranic
TSR	Technical Status Report
TVA	Tennessee Valley Authority
UARW	Upper Amargosa River Watershed
UNE	Underground Nuclear Explosion
UNLV	University of Nevada, Las Vegas

UNR	University of Nevada, Reno
UNRSL	University of Nevada, Reno Seismic Laboratory
UPS	Uninterrupted Power Supply
URL	underground research laboratory
USBLM	U.S. Bureau of Land Management
USBR	U.S. Bureau of Reclamation
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USNSN	U.S. National Seismic Network
UTM	Universal Trans Mercator
UZ	unsaturated zone
UZFRHP	Unsaturated Zone Fractured Rock Hydrology Project
UZIG	Unsaturated Zone Interest Group
UZN	unsaturated zone neutron
UZSBP	Unsaturated Zone Surface-Based Borehole Project
VAR	Variance Analysis Report
VARS	Video Archival Retrieval System
VLF	very low frequency
VOC	Validation Oversight Committee
VOG	Validation Oversight Group
VSP	vertical seismic profiling
WA	Western Atlas
WAC	Waste Acceptance Criteria
WAS	Work Authorization Submission
WAS/FWP	Work Authorization System/Field Work Proposal
WBS	work breakdown structure
WIPP	Waste Isolation Pilot Plant
WMNFC	Waste Management and Nuclear Fuel Cycle
WMSD	Waste Management Systems Description
WNRE	Whiteshell Nuclear Research Establishment
WORM	Write Once Read Many
WP	waste package
WP	Weapons Program
WPDRD	Waste Package Design Requirements Document
WRCC	Western Region Climate Center
WRD	Water Resources Division
WRG	Western Region Geology
WRI	Water Resources Investigations
WRIR	Water Resources Investigations Report
WRR	Water Resources Research
WSA	Wilderness Study Area
WSNSO	Weather Service Nuclear Support Office
WSP	Water Supply Paper
WT	water table
WVDP	West Valley Demonstration Project
WY	water year
XRD	x-ray defraction
XRF	x-ray fluorescence
YM	Yucca Mountain
YMP	Yucca Mountain Project

YMPB Yucca Mountain Project Branch
YMPO Yucca Mountain Project Office

1.2.1 SYSTEMS ENGINEERING

WBS 1.2.1.6 Configuration Management

Principal Investigator - L. Hayes

YMPB comments were coordinated for "Compliance Evaluation Plan for Information Resources Management (IRM)." A review of AP-6.17Q, "Q-List" was performed for YMPB.

Branch review comments were coordinated for 12 Quality Management Procedures.

1.2.3 SITE

WBS 1.2.3.1 Coordination and Planning

Principal Investigator - L. Hayes

M&I QA Implementation GSP 0G3193G2

Summary Account Manager - J. Stuckless

QA implementation assistance was provided in the field for the collection of metamorphic samples from the Bare Mountain vicinity and for a shallow seismic refraction survey conducted across the Windy Wash fault zone.

Seventeen draft technical procedures for the GSP were processed. Thirteen preliminary draft technical procedures, and/or modifications were prepared or changed as requested.

NCR-93-34 was initiated for samples collected without a technical procedure. The evaluation of seismic software continued. A Memorandum of Agreement between the Geologic and Water Resources Divisions for Lead Isotope Studies was completed and distributed.

B. Marshall participated in a number of committee meetings associated with revisions to QMP-3.03, R4. During the course of this work, definitions for scientific and engineering software were established, general definitions of software types with examples were established, responses to technical and QA reviews of the first draft of QMP-3.03, R4 were prepared, and a new draft, including revised forms, was produced. (40 hrs)

J. Paces participated in QMP-8.01, R3 committee meetings to address technical and QA review comments on the preliminary draft. (10 hrs)

Z. Peterman, S. Mahan, K. Futa, B. Marshall and J. Paces attended training sessions on Technical Data Management policy information and day-to-day operations. (4 hrs)

J. Paces participated in a DOE audit, specifically to examine calibration of analytical balances. (1 hr)

B. Marshall attended a CCC meeting (software QA). (3 hrs)

B. Bole attended YMP orientation classes.

M&I - Hydrology Program Management and Administration 0G3193H1

Summary Account Manager - D. Gillies

Status was completed on all 62 USGS and LBL hydrology summary-account schedules as of the end of May using schedule-status, progress, and variance information provided by each summary account manager. In general, P&S level cost variances in the hydrology program have been reduced from previous months such that none were over the Project level threshold. As a result of mid-year program reviews, six class-3 Cost/Schedule Change Requests were prepared and submitted to the Project Office. These C/SCRs affect hydrology/climate WBS elements 1.2.3.3.1.1.2, 1.2.3.3.1.1.4, 1.2.3.3.1.2.3, 1.2.3.3.1.3.2, and 1.2.3.6.2.2.1. An additional C/SCR for WBS 1.2.3.3.1.2.3 is in preparation. All of these C/SCR's are designed to fine-tune FY93 schedule, workscope and funding to bring them closer in line with the overall Project schedule.

D. Appel and D. Gillies met with staff of USGS-HQ Office of Ground Water and National Water Information System (NWIS). The purpose of the meeting was to begin formulation of an overall framework for determining which Yucca Mountain data will be input to NWIS. In general, it was agreed that NWIS should contain only "representative" or "summary" data from Yucca Mountain because of the tremendous volume and high geographic density of YMP data collection. However, individual YMP projects, such as the site potentiometric-level evaluation, will continue to be encouraged to utilize NWIS as their primary data-management tool, provided NWIS can meet their needs in an efficient and cost-effective manner.

M. Chornack participated in Nye County borehole drilling planning meeting to help coordinate DOE and Nye County objectives and methodology; and participated in DOE-YMPO meeting to discuss boreholes planned in FY94.

M. Chornack presented the Yucca Mountain overview during the public open-house tour.

M. Chornack attended UZ hydrochemistry staff meeting convened to familiarize S. Buchanan with data formats and data base management system used to store and track UZ hydrochemistry data.

M&I QA Implementation, Hydrology 0G3193H2

Summary Account Manager - W. Causseaux

Technical procedures

S. Frans is currently processing 50 hydrologic procedures and scientific notebook plans.

HIP technical procedures HP-178, R2; HP-176, R2; HP-243, R0; HP-251, R0; HP-259, R0 were approved.

Quality management procedures

The final draft of QMP-5.01, R5 was submitted to the QA Office for review and approval by W. Causseaux, G. O'Brien, P. Reilly, D. O'Leary, and W. Rodman.

D. Beck, S. Boucher, W. Causseaux, M. Chornack, M. Ciesnik, S. Frans, B. Guertal, J. Kume, M. Kurzmack, S. Maloy, K. Thomas, P. Tucci, J. Walker, J. Watson, R. Whitfield, and J. Woolverton performed reviews of QMP-2.05, R4; QMP-3.03, R4; QMP-3.04, R5; QMP-3.07, R5; QMP-4.02, R4; QMP-5.01, R5; QMP-5.03, R8; QMP-6.01, R6; QMP-12.01, R6; QMP-16.03, R3; QMP-16.04, R0; QMP-17.01, R6; and 17.03, R1.

Open items

NCRs 92-39 and 93-02 were closed June 10 based on successful verifications.

S. Boucher completed and submitted the disposition to NCR-93-23 (removal of DCP without calibration).

The HIP QA staff completed disposition of actions for NCR-91-25 regarding deficiencies associated with 105 procurement documents issued in 1989-90.

AFR-9207-01 has been successfully closed.

USGS-NCR-92-35 was verified and closed. The nonconformance report was documenting a deficiency on purchase order records for Scott Specialty Gages.

J. Woolverton assisted L. Anna in preparing an Activity Controls Specification Report (ACSR) for Study Plan 8.3.1.2.2.8 (Characterization of fluid flow in unsaturated, fractured rock). The ACSR is required for resolution of AFR-9306-01.

J. Woolverton assisted E. Kwicklis in preparing an Activity Controls Specification Report (ACSR) for Study Plan 8.3.1.2.2.9 (Site unsaturated-zone modeling and synthesis). The ACSR is required for resolution of AFR-9306-01.

Audits

S. Boucher, M. Ciesnik and J. Watson participated in audit YMP-93-10.

Several HIP quality assurance specialists attended the pre- and post-audit meeting for Audit DOE/YMQAD 93-10.

M. Pabst, J. Woolverton, S. Boucher, and J. Watson participated in the surveillance at the USGS Hydrologic Research Facility. The surveillance covered Criteria 12 on instrument calibration.

Meetings and travel

The HIP QA staff attended the June Open Items Meeting.

J. Woolverton traveled to the Nevada Test Site to perform an informal evaluation of UZ technical section compliance with QMP-12.01 (Instrument Calibration) at the Hydrologic Research Facility.

Records management

S. Boucher submitted the data package for the report "*Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1985-1988*" to the LRC.

Samples

J. Watson submitted sample collection forms to the SMF for a field trip conducted April 23 through May 2, 1993.

Software QA

S. Boucher and M. Pabst attended a software QA meeting addressing the USGS definition of scientific and engineering software.

Computer Operation & Data Management, Hydrology 0G3193H3 Summary Account Manager - C. Washington

Most of the computer operations unit's time was spent writing maintenance contract renewals and

researching and ordering equipment more than \$10,000.

Novell System

An updated version of NFS was installed on the Novell Server. This package will allow Unix clients to mount their Novell directories while working under the Unix operating system. In addition, the package will make it easier for all Unix clients to print to Novell printers.

Unix System

The Data General (DG) server was configured with another SCSI controller and two additional 1GB drives. The additional storage will ensure adequate space for all applications migrated from the Prime.

Four DG workstations were configured and installed in the Parfet Bldg.

Most of the DG software was upgraded.

YMPB, Las Vegas

Installed Optical Character Recognition (OCR) software on D. Zesiger's PC and instructed her on the use of it. This package will allow her to scan documents and create a WordPerfect file.

Field Operations Center (FOC)

Installed a Xerox 4045 printer for J. Brooks. Provided instruction on transferring files from AFIMS to her PC, loading them into WordPerfect, then printing the files locally. This not only took a load off the Xerox 3700 in Denver, but also negated the UPS cost of delivering four to five reams of paper twice a week.

Miscellaneous

Equipped COU Service vehicle with tool and storage cabinets, work benches, tools, racks and PC hardware.

S. Buchanan attended a Harvard Graphics Seminar.

C. Freestone attended an Ingres Users class.

C. Washington attended an IRM Short Range Plan meeting.

Scientific Reports and Project Documents, Hydrology 0G3193H4

Summary Account Manager - T. Brady

J. LaMonaca, HIP-YMPB, is currently processing 92 YMP-HIP scientific publications, 65 YMP-GSP scientific publications, 13 YMP-LBL scientific publications, and 42 abstracts.

The HIP review of the following reports was completed by T. Brady: "*Cosmogenic ³⁶Cl accumulation in unstable land forms-I effects of the thermal neutron distribution*" by B. Liu and F. Phillips; "*Volumetric analysis of debris eroded off a hillslope near Yucca Mountain, Nevada, during a convective rainstorm*" by J. Coe, P. Glancy, and J. Whitney; "*Meteorological, discharge, and water-quality data form two basins in central Nevada*" by P. McKinley and T. Oliver; and "*Numerical modeling of lateral infiltration into the Paintbrush unit at Yucca Mountain*" by M. Mc Graw, G. Bodvarsson, L. Flint, and A. Flint.

The HIP review of the following abstracts was completed by T. Brady: "*Large plot ponded infiltration*

on a skeletal desert alluvial soil sequence" by W. Guertal, L. Hoffman, and A. Flint; "A large-scale, automated, constant head, double-ring infiltrometer" by L. Hoffman, W. Guertal, and W. Davies; "Determination of the water retention function of a skeletal soil" by M. Nash and A. Flint; "Properties controlling the seasonal variability of the soil surface water content in an arid watershed" by M. Nash, A. Flint, and M. Nash; "Quaternary fault distribution at the high-level nuclear waste repository at Yucca Mountain, Nevada" by B. Simonds and J. Whitney; "Field water retention of skeletal desert soils" by D. Hudson and A. Flint; "Shallow infiltration processes in small arid land watersheds" by L. Flint, J. Hevesi, and A. Flint; "Characterization of the physical hydrologic properties of desert alluvium used in a large scale ponding experiment" by A. Flint, W. Guertal, M. Nash, and L. Hoffman; and "Developing and verifying a numerical model of infiltration in alluvium at an arid site" by J. Hevesi and A. Flint.

T. Brady reviewed Project Office comments on Study Plan 8.3.1.2.2.6, R1, "Characterization of the Yucca Mountain unsaturated-zone gaseous-phase movement.

WBS 1.2.3.2 Geology

Principal Investigator - J. Stuckless

WBS 1.2.3.2.2.1.1 Vertical and Lateral Distribution of Stratigraphic Units within the Site Area

Principal Investigator - R. Spengler

SCP 8.3.1.4.2.1 Vertical & lateral distribution of stratigraphic units LOE Account 0G32211Z93

Summary Account Manager - R. Spengler

R. Spengler and C. Hunter attended a meeting to discuss the need, definition, and requirements of a ramp-scale, 3-D model that emphasizes geotechnical information. The meeting included participants from USGS, SNL, the M&O engineering group, and LBL.

R. Spengler attended a meeting in Las Vegas for seismic line contract negotiations. C. Hunter and T. Brocher completely revised the proposal for acquisition of seismic reflection lines after cancellation of the FY93 RFP. Hunter also prepared a justification statement explaining the RFP (revised).

C. Hunter participated as a GSP technical representative in the QMP-3.03 revision meeting.

R. Spengler prepared for, presented discussion, and participated in the DOE-NRC Technical Exchange Meeting on Geophysics, Integration.

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

0G32211A93

Summary Account Manager - C. Hunter

Technical Activities:

3GGU11AA Conduct lithologic logging/synthesize borehole data

A detailed description of core from UE- 25 UZ#16 continued, with emphasis on the Prow Pass Tuff. Lithologic data were collected approximately every 10 ft between the depths of 1500 to 1680 ft. Work began on partial and preliminary descriptions of core from USW UZ-14, NRG-3, UE-25 NRG-2a, RF #8, and RF #3.

3GGU21AA Conduct isotopic sampling/analysis/evaluation/synthesis

S. Mahan continued preliminary work for the FY93 milestone on updating and cross-referencing the IGSG analytical data base. The data base contains all available major-element, trace-element

and radiogenic isotope data for Tertiary volcanics and Paleozoic sedimentary rocks at Yucca Mountain and surrounding areas. All analytical values in the data base have been quality checked and Mahan, D. Craft, A. Walker, and B. Bole have been trained in its use and maintenance. Walker and Craft input all geochemical and isotopic data collected over the last four months into the data base. In addition, Mahan obtained the most current lithostratigraphic nomenclature for Tertiary volcanics published recently by Sawyer et al. (1993). All lithostratigraphic data for volcanic samples in the data base have been revised and cross-referenced to the new nomenclature.

B. Bole obtained representative splits of JF-3 cuttings from bulk material, and organized the resulting sample suite for storage.

3GGU400 Construct isopach and structural contour maps

J. Nelson continued to update the lithostratigraphic model. Isopach maps for each subdivision of the Topopah Spring Tuff were entered, and work began on a structure contour map of the top of the Topopah Spring Tuff. R. Dickerson instructed R. Drake in establishing an internally consistent set of drill hole data, isopach data, and north ramp cross-section data to be utilized in creating the detailed 3-D computerized model of the north ramp required by the ramp engineers. Drake conducted a review of the data used to date, in the modeling process. This review performed on drill holes and isopach maps resulted in an overall increase in the precision of modeling near the north ramp.

Preliminary cross sections from Lynx were prepared and supplied to M&O engineers for use in conceptual design.

Quality Assurance:

Revision of technical procedure GP-20, R0, "*Volumetric estimation of lithophysae*" is in progress.

Planning and Operations:

A meeting to determine both short- and long-term goals in the development of the lithostratigraphic model was held June 10, 1993. T. Daley (LBL VSP studies), R. Spengler, C. Hunter, and D. Buesch (USGS), S. Beason (ESF mapping), R. Elayer (MK M&O, ESF ramp and drift design), C. Brechtel (for the SNL Soil and Rock study), R. Dickerson, J. Nelson, and R. Drake (mapping) attended. The short-term goal of completing a ramp-scale model within a few months was set. The model will incorporate all units to the surface and update those already modeled.

D. Buesch met with R. Raymond (LANL) to discuss his work using the SEM on lithophysae in the Topopah Spring Tuff.

Work Performed but not in Direct Support of the Scheduled Tasks:

At the request of the DOE and M&O, the Rock Characteristics section provided a letter detailing structural and lithologic information that should be collected at the drill site by drilling support (DS) personnel of T&MSS. This letter stresses the need for regularly scheduled training sessions of the DS personnel to establish and maintain correct and consistent recording of data. This allows information collected to meet QA requirements as preliminary data.

The following summary manuscript was submitted to the organizing committee and accepted for presentation at Focus '93: Site Characterization and Model Validation Meeting (sponsored by the American Nuclear Society and the American Society of Mechanical Engineers): "*Three-dimensional lithostratigraphic model at Yucca Mountain, Nevada: A framework for fluid transport modeling and engineering design*", by D. Buesch, R. Spengler, J. Nelson, and R. Dickerson.

SCP 8.3.1.4.2.1.2 Surface-based geophysical surveys 0G32211B93

Summary Account Manager - C. Hunter

Technical Activities:

3GGU265 Analysis of bids for seismic contract

The anticipated FY93 award of the seismic contract was dropped due to high costs and difficulties with available bids. The process will be started with a revised proposal with award scheduled in FY94. This will postpone milestone "Award bid: Seismic contract" (3GGU265M).

3GGU250A Conduct magnetic/gravity investigation in Yucca Wash

H. Oliver presented a talk at the DOE-NRC Technical Exchange Meeting on Geophysics Integration; the presentation described recent results of gravity and magnetic studies of the regional structure of Yucca Mountain, and new models of buried Pliocene cinder cones in the Lathrop Wells area, Midway Valley, and Yucca Wash. Twenty-three viewgraphs, prepared with R. Sikora's assistance, were presented and released at the meeting.

3GGU251A Prepare report: map of Yucca Wash

Data on Midway Valley magnetic and gravity investigations are expected to be released in a USGS Open-File Report in July 1993.

Planning and Operations:

H. Oliver met with E. Ezra and D. Brickey (EG&G) in Las Vegas to obtain a more detailed digital elevation model of the Yucca Mountain area. This will increase the accuracy of terrain corrections to new gravity data requested by DOE for next fiscal year. EG&G sent copies of 30 new 1:6,000 scale topographic maps and orthophotographs of 2-by 2-minute quadrangles in the immediate vicinity of the proposed repository.

SCP 8.3.1.4.2.1.3 Borehole geophysical surveys 0G32211C93

Summary Account Manager - P. Nelson

Technical Activities:

3GGU393A Analyze log and core data

P. Nelson initiated a quality assurance inspection for obtaining dielectric measurements from L. Shen at U. of Houston.

3GGU395 Maintain and expand existing data base

P. Nelson and RSN staff visited the Schlumberger field office in Evanston, Wyoming to review acquisition and reduction practices. Nelson reviewed and commented on a draft by R. Olson regarding the traces and scales to be used in UE-25 UZ#16 and explored the possibility of migrating the logging data base to the technical data base during the coming months.

3GGU371 Run magnetometer/magnetic susceptibility logs

Magnetic susceptibility and magnetometer logs acquired in boreholes UE-25 UZ#16 and USW NRG-6 during April 1993 were reduced and plotted. A TDIF for these logs was initiated.

Work Performed but not in Direct Support of the Scheduled Tasks:

Review comments on a core data report are still under consideration.

P. Nelson attended the DOE-NRC Technical Exchange Meeting on Geophysics Integration. Nelson reviewed previously published results to indicate the benefits of future logging.

WBS 1.2.3.2.2.1.2 Structural Features within the Site Area

Principal Investigator - R. Spengler

SCP 8.3.1.4.2.2 Structural features within the site area LOE Account 0G32212Z93

Summary Account Manager - R. Spengler

C. Hunter provided technical review of the criteria letter for preliminary design of ESF mapping gantry.

C. Hunter and R. Spengler reviewed the progress of geologic mapping in the Paintbrush Canyon area by R. Dickerson.

R. Spengler and C. Hunter attended the Drilling Coordination Committee meeting in Las Vegas, as GSP/rock characteristics representatives.

SCP 8.3.1.4.2.2.1 Geologic mapping of zonal features in the Paintbrush Tuff 0G32212A93

Summary Account Manager - C. Hunter

Technical Activities:

3GGF183A Conduct structural analysis/mapping-exposed fault zones

Mapping of fractures and geologic features within the Ghost Dance Fault system continued. L. Martin, R. Blackburn and J. Haney worked on site, and A. Braun continued to compile the mapped data. A road cut has been proposed to intersect several faults within the Ghost Dance Fault zone on the south flank of Antler Ridge. The location of the road was staked, and the environmental study boundary was located on the site. The field crew met with DOE personnel to discuss details of the road cut construction.

3GGF186A Conduct geologic mapping northeast corner of site area

R. Dickerson completed mapping the Paintbrush Fault to the southern end of the northeast quadrant. R. Spengler, C. Hunter, D. Buesch, and J. Palmer began initial field-check of map data in Upper Paintbrush Canyon. The distal facies of fluvially reworked bedded tuffs and soil horizons were investigated at the northern end of Busted Butte. It may be possible to correlate these rocks with the more proximal facies of lava flows and pyroclastic flows in upper Paintbrush Canyon.

A. Boulton prepared rocks and sample tracking information for 25 samples collected from this area. Thin sections are being prepared for petrographic analysis. Boulton began assisting R. Dickerson with stratigraphic column preparation.

3GGF200A Conduct mapping of western YM/northern Crater Flats

C. Fridrich compiled a preliminary colored map and cross section of approximately 70% of the outcrop in the Big Dune 7.5 minute quadrangle (southern Crater Flat). Fridrich used photogrammetry in the East of Beatty Mountain 7.5 minute Quadrangle (northern Crater Flat) to get strikes and dips in areas where measurements could not be obtained on the ground. Samples collected in Crater Flat last spring were cataloged and sent out for petrographic, chemical, and radiometric-dating analyses.

3GGF201A Conduct sampling/evaluate isotopes/geochemistry, phase I and II

J. Paces collected calibration data on U and Th isotope tracer solutions to be used as spikes for dating calcites from Ghost Dance Fault veins by mass spectrometry.

A. Walker initiated preparation of 110 whole-rock samples submitted by C. Fridrich. These rocks will be analyzed for the suite of whole-rock XRF elements, and a subset selected for Rb-

Sr isotopic compositions.

SCP 8.3.1.4.2.2.2 Surface-fracture network studies 0G32212B93

Summary Account Manager - M. Fahy

Technical Activities:

3GGF100 Compile map of Tiva Canyon data area

M. Fahy submitted the report relating to milestone "Map of Tiva Canyon" (3GGF100M) for review to R. Spengler.

3GGF081 Map and analyze Fran Ridge ESF pits area

M. Fahy has mapped approximately 46 percent of the area enclosed by P2001. No further progress was accomplished this month. A TDIF for the data collected will be prepared at the end of the fiscal year to meet milestone 3GGF081M.

Quality Assurance:

The QA office completed the documentation process for DIPS software.

Planning and Operations:

M. Fahy attended a mid-year review with USGS staff. Additional work may be allocated to map the roadcut at the Ghost Dance Fault. R. Spengler is to provide details of mapping required and M. Fahy will provide estimates of costs when the details are provided. Additional work will be handled through a modification to the task agreement.

SCP 8.3.1.4.2.2.4 Geologic mapping of the exploratory shaft and drifts 0G32212D93

Summary Account Manager - S. Beason

Technical Activities:

3GGF003B Prepare conventional map - launch chamber

3GGF013B Prepare photogrammetrical map - launch chamber

Mapping of the North Ramp starter tunnel continued throughout June with excavation still in the upper lithophysal zone of the Tiva Canyon Tuff. The upper half of the tunnel was mapped to station 1+25, including stereophotography, full-periphery mapping, and detailed line surveys.

Geologists collected 16 samples as part of the consolidated sampling program. The samples were collected between stations 0+60 and 1+18, and included fracture fillings, representative lithology samples, smectite from lithophysae, and contaminated and uncontaminated wall rock. Each sample was collected in accordance with test planning package 92-14.

Geologists continued work on a plan-view geologic map and on processing raw data from the detailed line surveys of the drainage channel above the portal cut.

J. Coe continued work on the photogrammetric processing of the first stereophotos of the pilot bore from the starter tunnel. Film diapositives are being processed by Johnson Controls World Services, but some delay has occurred in processing the survey data from the tunnel.

Planning and Operations:

S. Beason attended two meetings in Las Vegas regarding the design of a mapping gantry to follow the tunnel boring machine (TBM). The gantry would allow continuous geologic mapping behind the TBM without interference with mining. Discussions centered on how the gantry would interact with the TBM trailing gear. The participants generally agreed that the best solution is to have a "window" in the trailing gear - a section 150 to 200 ft long where the mapping gantry would be able to travel back and

forth, independent of the movement of the trailing gear and allow unobstructed viewing of the tunnel walls.

Finish dates for Milestone "Data submittal PDA: Geologic mapping" (3GGF50M), and task "Reduce data" (3GGF011B), will change to accommodate the new construction completion date expected September 20, 1993.

SCP 8.3.1.4.2.2.5L Seismic tomography/vertical seismic profiling 0B32212E93

Summary Account Manager - E. Majer

Technical Activities:

3GGF041 Incorporate/integrate VSP model with Rock Characteristics

E. Majer attended the DOE-NRC Technical Exchange on Geophysical Integration, where a presentation was made on the past and present cross-hole and VSP work at the NTS.

3GGF040 Acquire and analyze VSP data

Preparations for the VSP summer 1993 field work at Yucca Mountain were completed. Preparations included all testing and interfacing of system elements to ensure proper operation. A criteria letter was prepared and submitted to R. Craig in support of activity at USW VH-1 for the VSP work. USW VH-1 was selected as the primary target for the first VSP work because of the planned future work by the surface seismic reflection centered around USW VH-1. A report on the progress of the VSP field work was completed and submitted to R. Spengler. This relates to milestone "*Preliminary report: field VSP*" (3GGF050M), completed June 28, 1993.

Quality Assurance:

All reading assignments were completed on schedule.

WBS 1.2.3.2.5.3.2 Effect of Tectonic Processes and Events on Changes in Water-Table Elevation

Principal Investigator - J. Whitney

SCP 8.3.1.8.3.2.5 Effects of faulting on water-table elevation 0G32532E93

Summary Account Manager - C. Fridrich

Technical Activities:

3GTW010 Prepare interim report, April-May 1993

The report was submitted to USGS management and was edited for submittal to DOE. The report explains the proposed merging and streamlining of the five tectonic effects studies, described in the SCP. The proposed study will be up-to-date with respect to the recommendations of the National Academy of Science Panel on Coupled Processes (NRC, 1992), and it will eliminate the redundancy built into the SCP outline of these studies.

WBS 1.2.3.2.5.5.2 Characterization of Igneous Intrusive Features

Principal Investigator - J. Sass

SCP 8.3.1.8.5.2.3 Heat flow at Yucca Mountain and evaluation of regional ambient heat flow and local heat flow anomalies 0G32552C93

Summary Account Manager - J. Sass

Technical Activities:

3GAT016 Maintain laboratory/calibrate equipment
Continued tests of the high-temperature thermal conductivity apparatus.

Quality Assurance:

3GAT013 Continue field measurements

Documentation of the software for GPP-20, R3, involved in calibration of temperature sondes and calculation of temperatures during logging runs is awaiting a revision of the QMP covering this type of software.

Reviewer comments on Study Plans 8.3.1.8.5.2, R0 are being resolved.

Continued dialog with QA specialists on calibration vendors and on the calibration of balances, micrometers, and vernier calipers.

Maintained and updated QA records, and read all reading assignments as required.

Variations:

3GAT013 Collect field measurements

There were no field measurements carried out; no new holes are available and none of the WT holes has been reconfigured. Some remaining software QA issues preclude obtaining qualified data; however, if the software issues are resolved and the WT holes become available, field work can be started during FY93.

3GAT012 Collect core samples/prepare thermal conductivity specimens

This activity cannot proceed until activity "Collect field measurements" (3GAT013) is underway.

WBS 1.2.3.2.8.3.1 Relevant Earthquake Sources

Principal Investigator - J. Whitney

SCP 8.3.1.17.3.1.1 Identify relevant earthquake sources OG32831A93

Summary Account Manager - S. Pezzopane

Technical Activities:

3GSS002 Identify (preliminary) relevant Earthquake sources

Reviewed and revised a preliminary table of fault parameters for relevant earthquake sources.

Quality Assurance:

Participated in a committee to configure and control quality assurance procedures for scientific and engineering software.

Planning and Operations:

Planned field investigations to check fault parameters for sources where no information or studies exist.

SCP 8.3.1.17.3.1.2 Characterize the 10,000 year cumulative slip earthquake OG32831B93

Summary Account Manager - J. Whitney

Technical Activities:

3GSS118A Evaluate and revise deterministic seismic hazard methodology

Revised study plan, topical report, and ESF technical assessment.

3GSS119A Contribute to DOE Topical Report - Seismic Hazard Approach
Attended meeting to form consensus regarding seismic hazard methodology.

3GSS111A Conduct scoping study for magnetic estimate
Ongoing effort to assess various methods for magnitude estimates.

WBS 1.2.3.2.8.3.3 Ground Motion From Regional Earthquakes and Underground Nuclear Explosions

Principal Investigator - J. Whitney

SCP 8.3.1.17.3.3 Ground motion from Regional earthquakes and UNEs 0G32833A93

Summary Account Manager - J. Whitney

Technical Activities:

3GES010 Develop earthquake ground motion methodology
Held meeting to form consensus regarding approach to seismic hazard analyses.

3GES012 Prepare study plan
Began to prepare preliminary study plan and outline the plan's contents.

WBS 1.2.3.2.8.3.4 Effects of Local Site Geology on Surface and Subsurface Motions

Principal Investigator - J. Whitney

SCP 8.3.1.17.3.4.1 Determine site effects from ground motion recording 0G32834A93

Summary Account Manager - J. Whitney

Technical Activities:

3GSG101A Gather seismograms from prior studies
3GSG102A Gather geological and geophysical site information
These activities were completed June 30, 1993.

3GSG103A Develop initial standard ground motion model
Averaged recorded spectra from several events and several stations to produce the initial ground motion model. This activity is completed.

3GSG250 Conduct seismic field experiment #1
Completed the field experiment in Midway Valley; several earthquakes were recorded at all or most of the array of 8 stations.

3GSG104A Compare initial standard model with initial observations

3GSG105A Develop 1-D velocity model based on site info

3GSG106A Incorporate results of field experiment #1

These activities were started.

3GSG115A Prepare report

Prepared a short report on the observed and theoretical ground motion.

WBS 1.2.3.2.8.4.1 Historical and Current Seismicity

Principal Investigator - J. Brune

SCP 8.3.1.17.4.1.1 Compile historical earthquake record 0G32841A93

Summary Account Manager - J. Brune

Technical Activities:

3GSM102 Prepare progress report: historical earthquake records
The planned finish date now is September 30, 1993.

SCP 8.3.1.17.4.1.2 Monitor current seismicity 0G32841B93

Summary Account Manager - J. Brune

Technical Activities:

3GSM134A Monitor FY93 seismicity

CUSP recorded data for all of June 1993 except for 14 hours downtime. Installed hardware for high-frequency telemetry links at four sites between Yucca Mountain and Reno for the digital upgrade. Calibrated approximately 15 more SGBSN stations: three stations remain to be calibrated. Maintained portable equipment which monitors the Rock Valley fault zone.

Quality Assurance:

3GSM134A Monitor FY93 seismicity

Submitted several QA software documents for calibration software, real time CUSP, and seismogram picking software.

3GSM147A Reduce Little Skull Mountain earthquake data

Documented problems in gains for Reftek recordings to IRIS in order to get their response.

Planning and Operations:

3GSM134A Monitor FY93 seismicity

CUSP system was installed on the new VAX hardware, without the data actually being sent to it.

3GSM147A Reduce Little Skull Mountain earthquake data

Outlined the material needed to document the data recorded by UNR for LSM in preparation for making a data package.

WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain

Principal Investigator - J. Whitney

SCP 8.3.1.17.4.3.2 Evaluate Quaternary faults within 100 km of Yucca Mountain 0G32843B93

Summary Account Manager - L. Anderson

Technical Activities:

3GTQ007B Compile map of Quaternary faults within 100 km / study Beatty scarp

Completed map and accompanying text and tables, and submitted them to USGS on June 30, 1993. Submitted report on the Beatty scarp on June 7, 1993.

GTQ033B Evaluate faults SW of Yucca Mountain

Identified a potential trench site (AMT-1) on a possible southwestern extension of the Rock Valley fault zone, and marked it in the field. Made limited field studies of the Death Valley and Furnace Creek fault zones.

Variations:

Field work and the May NRC field review delayed completion of the Beatty scarp report. Delay in drafting services delayed the fault map. The incorporation of additional data delayed the completion of the accompanying text and tables.

SCP 8.3.1.17.4.3.4 Evaluate Bare Mountain fault zone 0G32843D93

Summary Account Manager - L. Anderson

Technical Activities:

3GTQ065 Conduct detailed Quaternary surficial geologic mapping on the east side of Bare Mountain Continued to analyze low-sun-angle aerial photographs of the Bare Mountain frontal fault zone and to compile preliminary surficial geologic map of the Bare Mountain frontal fault zone.

3GTQ060 Analyze trenches, Bare Mountain Fault Zone

Spent two days cleaning the walls of trench BMT-2. However, the trench requires shoring and/or benching before detailed study can continue.

Variations:

3GTQ060 Analyze trenches, Bare Mountain Fault Zone

An early start for analyzing the trenches was scheduled for March 1, 1993. Lack of archeology clearances for trench BMT-1 (Tarantula Canyon site) has forced excavation date back to August at the earliest. Trench BMT-2 was excavated on May 12, 1993.

WBS 1.2.3.2.8.4.4 Quaternary Faulting within Northeast-Trending Fault Zones

Principal Investigator - J. Whitney

Worked in the field June 13-20, in Rock Valley, Nevada. Evaluated and characterized fault scarps, fault trails, and deformation features associated with Neogene and Quaternary strike-slip faulting in Rock Valley. Collected samples for dating of deformed Tertiary units in Rock Valley.

SCP 8.3.1.17.4.4.1 Evaluate the Rock Valley fault svstem 0G32844A93

Summary Account Manager - D. O'Leary

Technical Activities:

3GTN011 Work on study plan; conduct field work on Rock Valley fault system
No work on study plan; field work underway.

WBS 1.2.3.2.8.4.5 Detachment Faults

Principal Investigator - J. Whitney

SCP 8.3.1.17.4.5.1 Evaluate significance of the Miocene-Paleozoic contact 0G32845B93

Summary Account Manager - W. Hamilton

Quality Assurance:

Planned additional field work field checking areas in order to complete map.

SCP 8.3.1.17.4.5.2 Evaluate postulated detachment faults in the Beatty-Bare Mountain area 0G32845B93

Summary Account Manager - W. Hamilton

Technical Activities:

3GTD004B Collect field and lab data - Bare Mountain and Yucca Mountain
Worked in the field June 7-11 at Bare Mountain and vicinity; collected metamorphic samples for thermobarometric studies. Documented samples for QA requirements.

3GTD012B Evaluate and conduct mapping, Bare Mountain and Crater Flat
Compiled about 70% of the outcrop in the Big Dune 7.5 minute quad (southern Crater Flat) into a preliminary colored map and cross section. These are being used, to better understand the hydrogeologic context of spring deposits in southern Crater Flat. Derived strikes and dips in the East of Beatty Mountain 7.5 minute quad (northern Crater Flat) photogrammetrically, in areas where measurements could not be obtained on the ground but where 3-point solutions on contact attitudes are clearly visible on air photos. Cataloged the samples collected in Crater Flat this spring; sent them off for petrographic, chemical, and radiometric-dating analyses.

Quality Assurance:

Documented samples as per QA requirements and submitted them to the SMF.

SCP 8.3.1.17.4.5.5 Evaluate age of detachment faults using radiometric ages 0G32845E93

Summary Account Manager - W. Hamilton

Technical Activities:

3GTD015B Conduct fission track dating, Bare Mountain
Collected samples; those suitable for dating will be submitted for mineral separations and fission track dating.

3GTD016B Conduct K-Ar dating of lower plate rocks Bare Mountain
Collected samples; petrographic analysis will determine which samples are suitable for dating.

Quality Assurance:

Documented samples for QA requirements and submitted them to the SMF.

WBS 1.2.3.2.8.4.6 Quaternary Faulting within the Site Area

Principal Investigator - J. Whitney

SCP 8.3.1.17.4.6 Evaluate Quaternary faulting within the site area LOE Account 0G32846Z93

Summary Account Manager - C. Menges

Coordinated with DOE and SAIC personnel to prepare for excavating new trenches on Solitario Canyon fault. Prepared material for modification of job package 92-12 required to begin drilling for buried offset marker bed on down thrown side of Stage Coach Road fault at SCR-T1. Basic administrative tasks related to scheduling and coordination of field work.

SCP 8.3.1.17.4.6.1 Evaluate Quaternary geology and potential Quaternary faults at Yucca Mountain 0G32846A93

Summary Account Manager - J. Whitney

Technical Activities:

3GPF026A Complete field mapping / Submit map for review
Revised map and completed a draft of the accompanying text explanation, and made copies for site-specific review by each contributor to the map.

SCP 8.3.1.17.4.6.2 Evaluate age and recurrence of movement on suspected and known Quaternary faults

Technical Activities:

3GPF19P Study faults on the west and east side of Busted Butte

B. Widmann has completed normalization of thermoluminescence samples TL-6 through TL-10. Samples currently are undergoing sunlight bleaching experiments.

J. Paces completed chemistry on two leach/residue aliquots each from two samples from buried soils in Trench 14d showing offset by the Bow Ridge fault. Isotopic compositions currently are being analyzed by alpha counting.

K. Futa continued to perform chemical separations and purifications of U and Th from rhizoliths from two different horizons in the hanging wall of trench SCR-T1 along Stagecoach Road.

J. Paces and K. Futa conducted further experiments with U-series chemical techniques in an attempt to maximize Th purity and recovery.

B. Marshall started work on translating a computer code written by K. Ludwig which computes U-Th isotopic compositional relationships simultaneously in three dimensions.

3GPF035A Study trenches excavated on Yucca Mtn. faults

Completed trench log of outer wall, north branch, trench 14D. Continued cleaning and logging south wall, trench 14D with B. Taylor. Completed cleaning and mapping of structures and contacts in Stagecoach Road trenches (SCR-T1 and SCR-T3. East sides of both trenches were re-photographed after extensive recleaning and repinning of trench walls. Requested modification of job package to initiate drilling on down thrown side of fault at SCR-T1.

3GPF029A Locate / excavate / log new trenches

Coordinated with DOE Field Test coordinator and SAIC Job Package coordinator to prepare for excavating new trenches on Solitario Canyon fault.

3GPF037A Study of scarp morphology on Quaternary faults

Completed technical review of Technical Procedure (GP-51) for topographic profiling of fault scarps, prepared by staff at USBR.

3GPF36 Prepare interim report: c/d trenches

Submitted TDIF on completed log on outer wall, north branch of trench 14D. South wall logging in progress. Report delayed.

3GPF032A Scarp degradation and evolution north Windy Wash

Sample sites located for exposure dating along northern Windy Wash and Solitario Canyon fault zones (C. Harrington).

3GPF039A Study geophysical survey - Windy Wash Fault

Completed shallow seismic reflection surveys (6 lines) along South Windy Wash fault.

3GPF21 Prepare interim report: trenches at Stagecoach Road

Trench logging at Stagecoach Road delayed because of unanticipated problems with trench degradation requiring the rephotographing of trench walls after multiple recleaning and repinning of units and structures on trench walls.

Variations:

Trench 14D/C Trench logs and reports are still behind schedule. Two walls have been logged (of three required for report) and logging of third is in progress. TDIFs have been submitted for compiled logs. Report has been delayed until approximately August, owing to scheduling of activities related to ESF seismic design work. Need to complete Stagecoach Road trenches and NRC field-trip demands. Stage Coach Road logs and reports were not completed this month. Logging in progress but will not be completed for 4-6 weeks owing to unanticipated problems with trench wall degradation over the winter. This required that the trench walls be re-photographed (unscheduled) before logging and the walls have been recleaned and re-penned 2-3 times during the past 6 weeks. Logging should be completed in 4-6 weeks and the report prepared by August. There should be no adverse impacts or delays in any trench milestones as all logs and reports for trenches 14D/C and Stage Coach Road will be completed in FY93. C. Menges continued intermittent work on data input and review to ESF Seismic Design Report. Reviewed section of manuscript on previous work at Trench 14D by E. Taylor.

WBS 1.2.3.2.8.4.10 Geodetic Leveling

Principal Investigator - J. Whitney

SCP 8.3.1.17.4.10.1 Relevel base station network 0G3284AA93

Summary Account Manager - G. Perasso

Technical Activities:

3GTM008J Prepare report on geodetic leveling
Finished preparing status report.

SCP 8.3.1.17.4.10.2 GPS Base - station survey 0G3284AB93

Summary Account Manager - J. Whitney

Technical Activities:

3GTM025 Write report on GPS and changes in last 10 years
Continued to reduce data; working on report.

WBS 1.2.3.2.8.4.12 Tectonic Models and Synthesis

Principal Investigator - J. Whitney

SCP 8.3.1.17.4.12.1 Evaluate tectonic processes and tectonic stability at the site 0G3284CA93

Summary Account Manager - W. Hamilton

Technical Activities:

3GTE08JA Integration of tectonic data
Studied industry reflection profiling in the Sevier Desert region which has been used to define a "Sevier Desert detachment." Completed a reconnaissance of Tertiary sediments in the eastern part of this region, and concluded that the "Sevier Desert detachment" does not exist.

SCP 8.3.1.17.4.12.2 Evaluate tectonic models 0G3284CB93

Summary Account Manager - W. Hamilton

Technical Activities:

3GTE045 Evaluate tectonic models
W. Hamilton evaluated reflection profiling of the Sevier Desert region, looked at Miocene sedimentary rocks in hills east of this area, and concluded that the postulated "Sevier Desert

Detachment" does not exist.

3GTE050 Perform boundary element modeling

Initial field work for the boundary element modeling effort undertaken June 14-19, evaluating structural elements and tectonic activity west and north of Yucca Mountain. Planning for lab and computer operations.

WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology

Principal Investigator - A. Flint

SCP 8.3.1.2.1.1.1 Precipitation and meteorological monitoring 0G33111A93

Summary Account Manager - A. Flint

Technical Activities:

3GMM035 Collect/analyze synoptic weather/reg/site met data

June is typically the driest month of the year in southern Nevada. However, a late winter storm surged in from the Pacific on June 5th. An analysis of the precipitation gauge network revealed that the HRF received 24mm on June 5th and June 6th. Normal for the month, in Jackass Flats is about 2.5mm. Yucca Mountain received a lesser amount, about 12-19mm depending on location and elevation. The upper level low pressure center came on shore north of the San Francisco area and passed almost overhead at Yucca Mountain. By comparison, Desert Rock received only 10mm on June 5th and a trace on June 6th. Las Vegas received only 2mm. Radar images obtained from the WeatherBank service indicated most precipitation fell in north-south oriented bands. It appears that one of the heaviest band was localized over the Jackass Flats with precipitation diminishing to the east and west. Isolated showers affected Yucca Mountain on the 20th. Weather station #3 measured 1mm, weather station #5 received 0.2mm, and Fran Ridge received only 0.1mm. Site data were collected for the month as well as satellite, lightning, and weather chart data.

A problem with the relative humidity (RH) data collected during the last six months of FY93 was discovered. The sensors (207 probes) failed the closing calibration at values below 60 percent RH. An NCR was written. RH data from all five weather stations will have to be checked and verified and it is planned to use RH data from the Weather Service Nuclear Support office weather station number 24 on the crest of Yucca Mountain as a comparison.

Work continued in the statistical analysis of precipitation data from the tipping bucket precipitation gage network. The goal is to characterize precipitation events spatially and temporally, and in terms of storm frequencies, duration, and intensity. Additional analyses will consider seasonal differences in precipitation events, storm genesis and movement, and if Yucca Mountain has any effect on storm development.

3GMM038 Prepare technical report FY92 synoptic/reg/site met data

The FY92 site meteorological data has been 80 percent reformatted into a columnar format from the datalogger format. This data set will be statically analyzed for each weather station and presented in an OFR. The synoptic data for FY92 are 70 percent cataloged according to storm type. The synoptic data will be collated into one or two graphical representations for each season or month showing storm trajectories and storm type according to Elliott's classifications. The frequencies of each storm type will be discussed.

WBS 1.2.3.3.1.1.2 Runoff and Streamflow

Principal Investigator - D. Beck

SCP 8.3.1.2.1.2.1 Surface-water runoff monitoring 0G33112A93

Summary Account Manager - T. Kane

Technical Activities:

3GRS017A Install 3 additional gages on Yucca Mountain

Construction of sheds on Amargosa River at Stateline (a regional site), and Upper and Lower Split Wash, (network sites), was completed.

3GRS023A Collect FY93 runoff and streamflow activity

A late spring storm moved out of the Pacific Northwest on June 5-6. The precipitation which was recorded, over what amounted to a region wide storm, saw a concentration of heavier rainfall in the upper elevations. A little over an inch of rain fell on Pahute Mesa, while .60 inches was the recorded average for the network sites around Yucca Mountain. No runoff was noted at any of the network streamflow sites.

C. Martinez and W. Nylund ran a field trip the upper reaches of Fortymile Wash.

3GRS025A Reduce FY92 runoff data and prepare report

This activity is to be rescheduled into FY94, as noted in the April PACS.

3GRS031A Complete reduction of FY86-90 data and prepare report

Activity is fifty percent complete, and will receive a concentrated effort through the month of July.

Work Performed but not in Direct Support of the Scheduled Tasks:

T. Kane worked with A. Ritcey, on future streamflow site installations.

T. Kane accompanied D. Hitch, D. Trudeau, and R. Laczniak on a field trip to establish future streamflow sites on the Amargosa River, in conjunction with the Ash Meadows discharge study.

T. Kane worked on procedures for classification of K. Mello as a data retriever of chemical analysis for streamflow water samples.

T. Kane worked on revisions to the following procedures: HP-44, R3; HP-45, R3; HP-115, R2; HP-116, R2; HP-117, R2; HP-169, R2; and HP-219, R1.

T. Kane attended the GET-training and the Sexual Harassment class.

WBS 1.2.3.3.1.1.3 Regional Ground-Water Flow System

Principal Investigator - J. Czarnecki

SCP 8.3.1.2.1.3 Regional ground water flow system LOE Account 0G33113Z93

Summary Account Manager - J. Czarnecki

Support project Operations

J. Czarnecki discussed sampling of carbonate and hydrogenic deposits with J. Whelan (USGS GSP) and attended a meeting to discuss the findings of E. Taylor (USGS HIP) and J. Paces (USGS GSP) regarding hydrogenic deposits at Site 199 in Crater Flat. A follow-up visit by Taylor and Paces with Czarnecki to look at hand specimens resulted in agreement that

hydrogenic deposits west of Stateline, Nevada in the Amargosa Desert were very similar to those at Site 199.

M. Ciesnik performed a technical review of: (1) modifications 3 and 4 to QMP-3.03, R3 (Software quality assurance); (2) a draft of QMP-17.03, R2; and (3) QMP-3.03, R4; and participated in a CCC meeting devoted mostly to outstanding issues from previously performed technical reviews of modifications 3 and 4 to QMP-3.03, R3.

J. Czarnecki attended the GET training course.

M. Ciesnik discussed with J. Ziemba issues relevant to the disposition on AFR-9207-01 as part of a verification activity. AFR-9207-01 was successfully closed.

M. Ciesnik participated in a one-day training course on QA/data related topics conducted by the USGS-YMP QA office.

M. Ciesnik participated in the exit meeting for the YMQAD Audit 93-10 and in the preparation of responses on five items in NCR-91-25.

M. Ciesnik reviewed alkalinity calculations manually and used a spreadsheet for two water samples collected by E. Gutentag.

J. Czarnecki met with D. Luckey, G. O'Brien, and W. Steinkampf, to discuss the priority of WT-holes that may be selected by Nye County for construction of adjacent monitor wells, to be used during the hydraulic testing/sampling of the WT holes. WT-1 was considered to be the most desirable of the WT-holes, provided NTS will permit the construction of drillholes by outside contractors.

C. Savard completed May FY93 PACS monthly report.

C. Savard read all operational and management memos as directed.

C. Savard developed a computer slide show for tour groups; which, presents data collected in Fortymile Canyon, showing ground-water recharge during 1992-93 and used the slide show during tours by the National Academy of Sciences, the Girl Scouts, the Nuclear Regulatory Commission, and DOE Public Open Houses. Savard also represented other saturated zone projects during the tours at the HRF.

C. Savard assisted the other regional saturated zone studies, by helping to collect and process ground-water samples from the Amargosa Desert area.

C. Savard began bench testing a water-level recording system consisting of a transducer, cable, and a data logger, for future use in the G-2 hydraulic testing program.

Collect FY93 moisture data

Project staff collected ground-water levels in UE-29 a#1, UE-29 a#2, and UE-29 UZN #91; took readings from rain wedges at UE-29 UZN #91 and #92; and collected neutron moisture logs from UE-29 UZN #91 and #92. Data collection frequency was decreased from previous months, which documented ground-water recharge from rainfall/runoff events in the Fortymile Wash watershed.

SCP 8.3.1.2.1.3.2 Regional potentiometric level distribution and hydrogeologic framework studies

OG33113B93

Summary Account Manager - J. Czarnecki

Technical Activities:

3GRG011A Test small diameter wells

A bailed water sample was obtained from a 1 1/4" diameter piezometer, in a dual-piezometer borehole (GS-3PVC) north of Shoshone Peak, in the Resting Spring Range, in the Amargosa Desert. Renewed attempts to obtain a sample from the deep piezometer (2000 ft deep) in NA-10 Steel resulted in successful sample collection.

3GRG062 Continue preparation of report: Hydrostratigraphy of the Amargosa Desert

J. Czarnecki met with W. Carr (USGS retired) to discuss processing a report on lithologic and geophysical logs from 2 oil-test holes in the Amargosa Desert. The report entitled "*Lithologic and geophysical logs of drill holes Felderhoff Federal 5-1 and 25-1, Amargosa Desert, Nye County, Nevada*" by W. Carr, S. Keller, and J. Grow was submitted for colleague and editorial review.

3GRG068 Survey water wells in Amargosa Desert FY93

G. Buchanan monitored several wells in the Amargosa Desert as part of the periodic water level monitoring program of the project. Depths to water in several wells on Franklin Lake playa were measured.

Work Performed but not in Direct Support of the Scheduled Tasks:

A CR-10 datalogger routine for running Bowen-ratio equipment was modified by J. Czarnecki, to incorporate regression equations for pairs of humidity and temperature sensors. The program and equipment were deployed at the Central Site at Franklin Lake playa for further testing and evapotranspiration estimation. Initial data analyses indicated a possible reversal in equipment wiring which required a site visit to verify.

J. Czarnecki represented the saturated-zone studies section at a public tour of the HRF in Area 25.

SCP 8.3.1.2.1.3.3 Fortymile Wash recharge study OG33113C93

Summary Account Manager - C. Savard

Technical Activities:

3GRG021B Write/revise Fortymile recharge data report

The sections pertaining to ground-water and surface water data were drafted.

3GRG023B Evaluate southern Nevada and California streamflow

Participated in a seminar at USGS headquarters on "Applications of nonlinear theory to hydrology" sponsored by the Branch of Systems Analysis. Presented a talk on "Chaos theory applications to streamflow time series from California and the possible implications of unpredictability for Yucca Mountain hydrology".

Retrieved 1991 Water Year data for Arroyo Seco and the Merced River in California. Converted period of record data for these two stream gage sites into a spreadsheet format for ease in future analysis work.

Talked to W. Thomas, USGS Office of Surface Water, about record extension techniques for

streamflow sites in the Yucca Mountain area. Yucca Mountain streamflow sites have short term records and nearby sites have long-term records which could be used for analysis. Thomas passed on several references for record extension techniques and explained that the Office of Surface Water will maintain the record extension computer programs.

Talked with H. Lins, USGS climate change program, about teleconnections between atmospheric patterns and western US streamflow. Lins passed on recent publications from the climate change program and recommended personnel to contact within the program who share research interests in El Nino effects.

WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling

Principal Investigator - J. Czarniecki

SCP 8.3.1.2.1.4 Regional hydrologic system synthesis and modeling LOE Account 0G33114Z93

Summary Account Manager - J. Czarniecki

Support project Operations

F. D'Agnese, C. Faunt and J. Czarniecki prepared the monthly PACS report. D'Agnese, Czarniecki, and Faunt attended HIP technical meeting on the nature and possible origin of hydrogenic deposits studied at Site 199 in the southern part of Crater Flat.

C. Faunt and F. D'Agnese attended QA verification activity to document transition of the PI for 3-D hydrologic modeling.

J. Czarniecki participated as technical reviewer of a QA verification activity of SCP activity 8.3.1.2.1.4.4; which, was held to facilitate the transfer of the activity to a new activity chief.

M. Ciesnik worked on setting up a PC computer for the SUN and DG Unix environment, and also worked on a Unix version of SURFACE III contouring software to generate contour maps for ground-water modeling purposes.

J. Czarniecki provided W. Sockwriter with an updated version of the PLOT88 software library for installation on the SUN computer.

SCP 8.3.1.2.1.4.2 Subregional two-dimensional areal hydrologic modeling 0G33114B93

Summary Account Manager - J. Czarniecki

Technical Activities:

3GRM028A Draft report on preliminary simulation of large hydraulic gradient

Further plotting of contours from simulations related to the large hydraulic gradient were made using an automated editing and plotting routine.

3GRM031A Calibrate 2-D FE model

Refinements to a 2-D finite element mesh of the subregional flow system were made using the Grid Builder software package.

Work Performed but not in Direct Support of the Scheduled Tasks:

J. Czarniecki discussed recharge efforts to examine the effects of increased recharge to the ground-water flow system of Yucca Mountain and vicinity with R. Luce (NWTRB).

J. Czarniecki wrote an abstract entitled "*Automatic editing and graphical postprocessing of output from*

the MODular Finite Element (MODFE) model" for the 7th National Computer Technology Meeting of the U.S. Geological Survey, to be held in New Orleans in April, 1994.

SCP 8.3.1.2.1.4.4 Regional three-dimensional hydrologic modeling 0G33114D93

Summary Account Manager - F. D'Agnese

Technical Activities:

3GFH022C Refine 3D Hydrogeologic Model

C. Faunt continued plotting horizon data in three-dimensions. All of the data was transferred to digital point files. The hydrogeology map and topography data were combined to make point files of the surface hydrogeology.

C. Faunt developed the preliminary grid surfaces of the 10 hydrogeologic units in the region using major regional faults. These faulted surfaces were visualized in 2D cross sections to evaluate validity.

The paper on structural analysis is completed. Final maps and figures are being prepared. A rough draft is being reviewed by K. Turner. These comments are being incorporated into the manuscript.

C. Faunt obtained earthquake epicenter data from the USGS Earthquake Information Center in Golden. Data will be incorporated into structural analysis of the region.

K. Turner continued review of map and text developed for "*Hydrogeology of Death Valley Region, Nevada and California*", by C. Faunt and F. D'Agnese.

The OFR entitled, "*Preliminary digital geologic maps of the Mariposa, Kingman, Trona, and Death Valley sheets, California*", by C. Faunt, F. D'Agnese, and K. Turner was submitted to M. Kidd (District) for editorial review and was returned to D'Agnese for revisions.

3GRM041A Generate model input arrays

F. D'Agnese began to convert field checking data for the regional vegetation map into digital format. Data provided by Webb of the NTS was also converted from McIntosh ASCII to PC ASCII for use in finalizing vegetation classes. The report on regional vegetation mapping was continued.

K. Turner continued to complete report on the "*Amargosa Desert vegetation mapping*" originally conducted by L. DeMarco.

F. D'Agnese completed accounting of water use data for Death Valley region and developed map layers representing water use.

F. D'Agnese completed the preliminary regional "*Potentiometric surface*" map. Additional changes will be made through the end of the fiscal year while the WRI Report and Conference paper about map construction are written. Grid from map was converted for use in 3D modeling, and boundary conditions for the 3D model were determined.

F. D'Agnese continued preparing the report on the "*Hydrology of the Death Valley Region, Nevada and California*".

F. D'Agnese continued analysis of regional spring discharge and its relation to regional flow.

A grid and map were completed and saved for 3D modeling.

A modification was made to the Eakin "first approximation" method of recharge estimation. Changes were incorporated into an ARC/INFO Macro to be processed in GRID. The estimate will be the second of three refinements to recharge estimation. The third will involve regional water balance estimates.

3GFH009C Continue testing with chemical models

D. Perfect continued cluster analysis of the hydrochemical data base. Preliminary t-tests were run to test for separation of the nine cluster groups that were defined. Because the previously made ARC/INFO spatial plot of cluster data showed many values plotted on top of one another, several smaller plots had to be made so that the cluster data could be viewed clearly.

Basic statistics were run for the hydrochemical parameters within each cluster group. Corresponding plots of cluster versus average concentration of the hydrochemical parameters were made, showing standard deviations. Based on the spatial plots and the previously made lithology frequency plots and piper diagrams, the clusters were interpreted in terms of hydrochemistry. A preliminary report was written on the results of the statistical analysis of the hydrochemical data base and the methods used.

3GFH014C Evaluate GIS methods

F. D'Agnesse wrote a paper entitled, "*Using GIS for three-dimensional ground-water flow modeling, Death Valley Region, Nevada and California*", for the NCGIA Breckenridge Conference. The paper was given to K. Turner and C. Faunt for review.

WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration

Principal Investigator - A. Flint

SCP 8.3.1.2.2.1 Unsaturated zone infiltration LOE Account 0G33121Z93

Summary Account Manager - A. Flint

Support project operations, FY93

Activities for June included preparation of monthly PACS. W. Guertal, M. Nash, J. Curtis, and W. Davies participated in a public tour on June 19. Guertal gave six (1 hour) small group tours to various groups at the HRF.

QA reading assignments were completed. W. Guertal provided a technical review a QMP. HP-263 was revised following technical review and sent to Denver for re-typing and additional QA review.

Abstracts for the Annual Soil Science Society of America Meetings were prepared by A. Flint, L. Flint, W. Davies, J. Hevesi, L. Hofmann, W. Guertal, D. Hudson, M. Nash, and M. Nash. Technical reviews were done by the staff of the Hydrologic Research Facility. All abstracts were sent to Denver for review.

A. Flint, D. Hudson, and J. Curtis attended the meeting of the National Academy of Sciences Radioactive Waste Management Board. A. Flint discussed the new UE-25 UZ#16 data and modeling results.

W. Guertal and D. Hudson spent eight days involved in capital equipment, REECO, and general

procurement.

Neutron moisture monitoring FY93

All neutron holes were logged this month. There was a QA surveillance of the neutron logging program.

SCP 8.3.1.2.2.1.1 Characterization of hydrologic properties of surficial materials 0G33121A93

Summary Account Manager - A. Flint

Technical Activities:

3GUI012 Collect/analyze consolidated/unconsolidated materials

The monthly sampling of surficial materials at each of the neutron boreholes was continued. Preliminary analysis of the data collected suggests that this sampling program will be continued next year. Plans are underway to QA the program.

Sampling and data collection was continued at the tensiometer transects located in USW WT-2 wash. Bulk samples have been collected from each of the tensiometer locations. These samples have been sieved into two fractions (less than 2 mm and greater than 2 mm). Particle size analysis, coarse fragment content, and selected chemical properties will now be determined for each of these fractions. Estimations of plant cover, type of plants, and rock outcrop cover are currently being performed at this site.

3GUI015A Develop preliminary geohydro/surficial/infiltration/runoff map

Each of the neutron access holes are being placed into one of 4 geomorphic surface map units and into a surficial geologic materials map unit. This work is being done because the boreholes will be the starting points for a bulk sampling program. In addition, the boreholes are going to be used as point locations for each of the various layers of information used in the GIS software system.

A first attempt was made at determining what information will be placed in the GIS (geographic information system) data base. Personnel at the HRF currently are evaluating the items on the list and are developing the necessary data base structures.

SCP 8.3.1.2.2.1.2 Evaluation of natural infiltration 0G33121B93

Summary Account Manager - A. Flint

Technical Activities:

3GUI305 Conduct water balance studies FY93

The soil around the five 30 cm deep field tensiometers dried below the tensiometer range. Soil samples were collected at each location for measuring field retention data. Water retention data was also collected from the tensiometer transects in WT-2 Wash. Soil samples were collected from the transects in WT-2 Wash for particle size analysis and determination of hydraulic properties. The Bowen ratio data were collected. Modeling exercises to predict evapotranspiration as an empirical function of measured solar radiation, air temperature, and simulated soil water contents were conducted.

3GUI307 Develop small scale watershed model

Field observations and maps were used to provide preliminary spatial boundaries of the WT-2 wash watershed. Four potential topographic positions (ridgetop, sideslope, alluvial terrace, and active channel) used in a watershed model of Yucca Mountain were identified. Topographic features such as slope, aspect, microtopography, and elevation; geologic features such as soil and bedrock; and meteorological factors such as precipitation were preliminarily identified as

the principle mechanisms influencing infiltration at Yucca Mountain. Models were used to predict heat load at various locations in the WT-2 Wash watershed. Literature on watershed models was reviewed.

3GUI310 Evaluate shallow/deep infiltration process FY93

Preliminary data of saturation, porosity, and bulk density from the UE-25 UZ#16 core processed under HP-229 was compared to the UE-25 UZ#16 modeling results. The original model which used hydraulic properties from outcrop transects and estimated stratigraphy produced reasonable agreement with the measured saturation data and porosity data. The largest discrepancies came from differences between the modeled stratigraphy and the observed stratigraphy. Correcting the model to the observed stratigraphy produced good agreement between the modeled and observed data.

3GUI050 Prepare report historical neutron hole data

Historic neutron probe 10-Count data and the top and bottom shielded counts from each measured neutron hole were graphed to evaluate the stability of the neutron probe through the neutron logging program. Calibration tank data was collected for the neutron probes. The historic calibration tank data and the initial neutron logs of the calibration holes were organized in preparation for determining calibration curves for the neutron probes.

SCP 8.3.1.2.2.1.3 Evaluation of artificial infiltration 0G33121C93

Summary Account Manager - A. Flint

Technical Activities:

3GUI636 Conduct infiltrometer study/prepare OFR

Research efforts have been primarily focused on reviewing pertinent literature for the OFR. Development of a tension infiltrometer, which will be used on sloping surfaces has begun. Once all of the parts for the prototype system are obtained, construction of the unit will begin.

The double ring infiltrometer was run at Neutron Access Hole N-14. This is the site of the large scale TDR calibration experiment. This was the first test of the double ring system in loose, unconsolidated alluvium. The unit was able to supply a steady supply of water and performed to expectations. Continued testing of the unit at this location will occur in the next month.

3GUI640 Conduct prototype ponding/SPRS/LPRS study-finalize methods

Periodic neutron readings at N-85 showed that the internal drainage of water has stopped. There has been no detectable change in the water contents, at depth, during the past month. Monthly measurements will be continued for the remainder of the year.

A large scale calibration of the TDR system began at Neutron Access Hole N-14. This site is located in the alluvial channel fill at the mouth of Pagany Wash. A 100 ft x 45 ft block was established at this location. The block was subdivided into 15 ft x 15 ft grids. This gives an experimental design of six treatments replicated three times. Three sets of TDR probes were randomly placed in each of the grid blocks. In addition to these probes, two sets of reference probes were placed in the center of the block. TDR traces were gathered for three days prior to the start of the experiment so that the in-situ moisture content (to 30 cm) could be determined. Two sets of probes in each grid block were then wetted with approximately 4 liters of water. At selected intervals, following the wetting, bulk density and water potential samples were collected from the material surrounding each of the probe sets. Samples were taken to a depth of 30 cm at each location. Preliminary data suggests that bulk density is fairly uniform across the site. The relationship between TDR volumetric water content and that measured by gravimetric means suggests that some changes may be required in the equation that calculates

TDR volumetric water content. Each of the samples obtained from the probe pairs will be analyzed for particle size analysis, coarse fragment content, Ph, EC, carbonate content, and organic matter content.

WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study

Principal Investigator - J. Rousseau

SCP 8.3.1.2.2.3 Percolation in the unsaturated zone, surface-based study LOE Account 0G33123Z93

Summary Account Manager - M. Chornack

HRF borehole monitoring and sensor recalibrations

Continued monitoring of the HRF boreholes; completed fabrication of 2 more cable/tubing spool racks for borehole instrumentation; fabricated seventy-two thermistors for use in the borehole instrumentation program; assisted saturated zone with calibration of four barometers; continued with construction of mounting apparatuses for installing the gas sampling system in the insulated instrument shelters; coordinated with EG&G to ascertain their capability, willingness, and costs to construct insulated instrument shelters for the in-situ instrumentation and monitoring program; coordinated with machine shop for fabrication of DISA mounts for use in instrumenting small diameter (6 inch) UZ boreholes; placed the order for the Druck pressure transducers (100 units); submitted a request and the paperwork to hire replacement staff for the VSP program in July; continued work on developing borehole stemming and instrumentation forms; continued development work on the UE-25 UZ#16 stemming plan; forwarded the USW UZ-6s record package to the LRC; performed extensive processing software documentation for QA purposes (four documentations were completed and given to M. Pabst); ran round-trip shuttle from Mercury-Denver-Mercury with stop-off in Logan, Utah to pick up last order of psychrometers; and select staff members attended advanced Novell classes.

Baker Oil Tools was contacted to ascertain the status of the modified sliding screen apparatus that will be used in the large diameter (12 inch) UZ boreholes. Design drawings have been completed. The prototype unit still needs to be manufactured.

The procurement request for two additional SPRTDs for the calibration laboratory was processed and the order for a solid fiberglass pump rod for stemming small diameter UZ boreholes was awarded. The order for fiberglass tubing to instrument UE-25 UZ#16 and USW UZ-14 was submitted and the order for teflon tubing to instrument USW UZ-14 and 2 small diameter UZ boreholes is being processed by the Central Region Procurement Division. Orders for the digital systems multimeter/platinum resistance thermometers for use in the calibration of sensors, and the solenoid valves to be used in the assembly of DISAs were submitted.

Completed the recovery and packaging of IDAS (GemLink) communication equipment for the project turn-in. All PDP 11/73s, incrypters, and data communication equipment formerly assigned to the IDAS program have now been inventoried and prepared for turn-in.

J. Rousseau and J. Kume met with RSN and SAIC personnel to discuss the proposed November, 1993 instrumentation of UE-25 UZ#16. Lists of the items provided by the USGS and RSN-REECO were made available to both parties. It was agreed upon to hold a follow-up meeting in about a month to review the progress being made in obtaining the items needed.

J. Rousseau and G. LeCain submitted a summary assessment of the Deep UZ project's capability to support high priority testing and instrumentation of selected boreholes at Yucca Mountain to provide baseline data prior to construction of the ESF N-S tunnel. This assessment was

submitted to the USGS Nevada Operations office.

Air-k testing

The PI began preparing the FY94 budget requirements for both surface and ESF air-permeability testing. The budget is based on the FY94 PACS that were written in 1992. The PACS calls for additional staff and increased funding for all activities.

The PI and support staff attended a meeting of the ESF construction and design team. The PI expressed concerns about a large gap in the construction team's understanding of the scientific testing requirements of the program, and the PI's understanding of the construction equipment, limitations, and requirements. The PI suggested that the construction team and all ESF PIs meet and give informal presentations on the requirements of testing and construction.

Support project operations

The Rotronics sensor that was repaired and returned in May broke again and was returned to the manufacturer for repair.

L. Flint lead a tour for nine people from LLNL. There was an all day public tour of the Hydrologic Research Facility.

A QA surveillance of instrument calibrations was conducted.

The REECO procurement package for the unsaturated flow apparatus was prepared and was submitted.

SCP 8.3.1.2.2.3.1 Matrix hydrologic-properties testing 0G33123A93

Summary Account Manager - A. Flint

Technical Activities:

3GUP005A Measure rock properties/state variables FY93

UE-25 UZ#16 cores from 300 ft to 1405 ft were received from the SMF. The cores from 300 ft to 504 ft were completely processed through HP-229. The processing of UE-25 UZ#16 cores from 505 ft to 1405 ft through HP-229 was initiated. The installation of the large relative humidity oven was completed and it was used for core drying.

3GUP025A Determine matrix permeability FY93

The measurements of the permeabilities of the Prow Transect were completed. Interpretation of these measurements continued. The samples with low permeabilities which could not be measured with the current low pressure permeameter will hopefully be run on the high pressure permeameter when it is assembled. Lack of operating funds has indefinitely delayed assembly of this needed device.

3GUP031A Determine moisture characteristic curves FY93

Moisture release data for two rock samples from the Prow Pass unit were measured with the CX-2. This data is needed to provide hydraulic property parameters for the UZ-16 modeling. Analysis and interpretation of the moisture release data from the fine and coarse soil fragments was started. Preliminary results indicate that combining the water release properties of the soil fractions of a skeletal soil produces a good description of the water release properties of the composite soil.

SCP 8.3.1.2.2.3.2a Surface-based boreholes studies 0G33123B93

Summary Account Manager - J. Rousseau

Technical Activities:

3GUP052A Test and calibrate equipment

The Ruska deadweight tester and DPI 510 pressure controller were recalibrated in preparation to begin calibration of the pressure transducers for the air-permeability testing program.

Received calibrated electronic units from Ball Aerospace for use in the DAS for the drill-hole instrumentation program.

Newly-hired staff were trained in the calibration procedure for the Fluke SPRTD/ multimeter using the calibration laboratory's primary temperature standard.

Continued work on the electronic diagnostic testing procedure for operator calibration/verification of the thermocouple psychrometer benches.

Began development of a DISA (downhole instrument station apparatus) testing and checkout procedure to diagnose the functionality of the device upon completion of final assembly.

3GUP054A Calibrate sensors

Continued with calibration of thermistors for the air permeability testing program.

3GUP056A Prepare UE-25 UZ#16 completion report

Continued the compilation of fracture data for UE-25 UZ#16. The draft of the completion report is in progress.

Planning and Operations:

3GUP053A Drill UZ boreholes

Continued the monitoring of the drilling activity at USW UZ-14. The borehole depth at the end of the reporting period was 860 ft.

SCP 8.3.1.2.2.3.2b Vertical seismic profiling 0G33123C93

Summary Account Manager - J. Rousseau

Technical Activities:

3GUP081B Conduct VSP prototype field test and analysis

Fifteen days were spent on cross-hole seismic work at CSM Experimental Mine. To date ten common receiver gathers have been acquired and 33 more are planned. The 3-component Oyo wall-locking geophone has been working satisfactorily in the new boreholes, which were drilled especially for that tool. Data from the cross borehole field experiment are consistent and reproducible. First (direct) arrivals are recognizable, but it is yet to be determined whether diffractions from the target void will be noticeable. Preliminary analysis of data indicates the data are consistent and reproducible. Considerable coherent noise is present.

3GUP084B Provide velocity measurements UE-25 UZ#16 core

All of the core samples have been received from the NTS. Several are already in the hands of the contractor, PBT, Inc.

Variations:

3GUP081B Conduct VSP prototype field test and analysis

Over 1500 source-receiver, cross-borehole data traces from CSM Experimental Mine, Idaho Springs have been acquired. Data acquisition should be complete by mid-August. Approximately 5000 3-component source receiver combinations will have been acquired. The two month schedule slippage will not affect the NTS schedule.

Work Performed but not in Direct Support of the Scheduled Tasks:

Approximately 265 hours were spent in support of the following tasks: Assisted in preparation and attended the Las Vegas, NRC Geophysical Integration Technical Exchange, visited the NTS facilities (SMF, Core Library, Telecommunications, etc.) and UE-25 UZ#16 in preparation for zero offset VSP and walkaway survey; in process of pursuing a video board card for installation in RS/6000 work station; performed analysis on Yucca Mountain model image; passed the SAIC YM procedures and rules test; and prepared reports for, and held consultations and discussions for the Yucca Mountain project.

SCP 8.3.1.2.2.3.2c Integrated data acquisition system 0G33123D93

Summary Account Manager - J. Rousseau

Technical Activities:

3GUP072C Develop, test, review, and integrate software

Additional work was done to debug and refine the HDAS system in June. The optical disk jukebox and the EISA file server have been received. Additional work was done on the IDISPLAY program for displaying HDAS data. The new high speed network modems were received.

3GUP076C Evaluate prototype data from HRF borehole

Evaluation of data from the HRF boreholes continued throughout the reporting period. Sensors in these boreholes have been operating for over 20 months and continue to provide reliable data.

3GUP071C Prepare for instrumenting UZ borehole

The precision resistors were calibrated and used to diagnose problems with one of the racks in the HRF calibration facility. Diagnostics have been developed for the thermistor and pressure transducer calibration racks. Additional work still needs to be done to develop diagnostics for the psychrometer racks. Preliminary work has been done on a program to test out the DISA's after they are assembled with the calibrated sensors.

SCP 8.3.1.2.2.3.2d Air-permeability and gaseous-tracer testing 0G33123E93

Summary Account Manager - G. LeCain

Technical Activities:

3GUP033D Construct and test backup packer assembly

Work on the backup packer assembly has been halted until questions about the USBR design of the load bearing connections are answered.

SCP 8.3.1.2.2.3.2e USW UZ-14 Support 0G33123F93

Summary Account Manager - L. Hayes

Technical Activities:

3GUP301A Procure and test equipment

Pressure transducer order has been awarded to Druck Inc., and delivery of these units is expected in December, 1993.

There is no change in the status of the Baker Oil Tools sliding screen apparatus from the May report. A modified unit has been designed, but has not yet been manufactured. FY93 funding is not sufficient to order the units prior to close-out of fiscal year.

The order for the fiberglass pipe has been forwarded to Central Region Procurement Division.

3GUP304A Conduct tracer injection and monitoring support FY93

There was no change from the May status report. Continued to provide tracer injection support at USW UZ-14.

3GUP302A Provide PI and other site support - FY93

Finished logging of the first 450 ft of core from USW UZ-14 and will log additional 500 to 600 ft in July.

3GUP303A Conduct assessment of perched water - FY93

There has not been any perched water encountered as of July 1, 1993. The borehole currently is at 860 ft.

WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study

Principal Investigator - M. Chornack

SCP 8.3.1.2.2.4 Percolation in the unsaturated zone, ESF study LOE Account 0G33124Z93

Support Project Operations, FY93

B. Britain continued to work on a draft technical procedure for calibrating thermocouple psychrometers, and attended a workshop on Harvard Graphics.

A comment resolution of the technical review of USGS-QMP-5.01, R5, "*Preparation of technical procedures*", was completed.

G. Severson attended a Keithley seminar on low level measurements in Golden, and completed technical review of the paper, "*Spatial variability in hydrologic properties of a volcanic tuff*", by J. Istok, C. Rautman, L. Flint, and A. Flint.

The May PACS and LOE reports were prepared, and a considerable number of purchase requests were prepared and processed.

L. Anna, E. Kwicklis, G. Severson and S. Anderton attended a mandatory YMP-QA Procurement Workshop on, and the New underground worker training.

S. Anderton prepared a draft table of the water samples collected for the prototype percolation test requiring water chemistry analysis. G. Severson completed the request and is conducting ongoing discussions with the NWQL regarding these analyses. Anderton continued supporting the percolation test and the Block E experiments, as well as the tests on sample 13B. The thermocouple psychrometers used in the Block E experiment are still being re-calibrated to check for drift during the experiment. This was started in March and will continue into July with one more run on the 0.5 molal NaCl solution.

Work was completed on setting up the equipment for air-k testing (post) on Block E for the percolation test. These tests are in progress and should be finished in early July.

Work started again on the imbibition tests to be conducted on the ten 1-inch diameter cores from the trimmings of Block E. Imbibition tests are in progress.

Three staff members attended the FRHP meeting.

L. Anna, E. Kwicklis, and B. Britain attended an all day QA meeting on the definition of

"Scientific" software, and Kwicklis and Britain attended the follow up meeting.

L. Anna attended several meetings to finalize the writing of QMP-3.03R4.

F. Thamir attended a three day Technical Writing class; he continued writing a technical procedure on "*Calibrating and using thermocouple psychrometers*"; and is revising the first draft of a technical procedure on "*Calibrating pressure transducers*". Thamir technically reviewed two reports; "*Spatial variability in hydrologic properties of a volcanic tuff*" by J. Istok et al, and HP-263, R0, "*Particle size analysis*", and he reviewed AP-8.1, "*Land access and environmental compliance*".

Thamir attended and gave a presentation at the Integrated Data System (IDS) Information Exchange meeting, which included USGS data acquisition requirements for the ESF tests; and reviewed the Computer Security Awareness course as a reading assignment.

SCP 8.3.1.2.2.4.1 Intact fractures testing in the ESF 0G33124B93

Summary Account Manager - G. Severson

Technical Activities:

3GUS020J Design and conduct tests

Consideration was given to the design of the tests to be conducted under this activity. A castable, machinable engineering plastic material has been selected for use as a "blank" that has essentially zero permeability and good physical properties. A vendor has been located and drawings for the "blank" were submitted in early June. A design for a sample preparation cradle was completed and most of the materials needed have been delivered. The laboratory vacuum saturation table modifications have been completed and the table re-assembled. Drawings were submitted to a machine shop for modifications to an existing LVDT calibration stand. The stand should be completed in late July or early August. The actual start of testing under this activity is dependent on the design and fabrication of the vessel.

3GUS024J Complete OFR on projection moire

Progress toward this "final report" continues. A draft of this OFR will be submitted for review after "Complete journal paper: detail moire" (3GUS015J) is completed.

3GUS028J Design/fabricate vessel

All of the pieces for the low-pressure vessel were completed in mid-June. Some of the plumbing hardware has been received but, a number of items still have not been delivered. The remaining electrical feed-throughs were received in June. The low-pressure vessel pieces were assembled and some minor adjustments will be made to the walls of the vessel, to make it easier to seat the poly pak seal.

A preliminary design was decided upon for the test stand for the low-pressure vessel. This was submitted to a machine shop for estimates of cost and time involved for fabrication in April. Conversations with the shop indicated an estimate would be available in mid-June but, may not be available until sometime in July.

3GUS022J Select analog site-fracture sampling-evaluate/develop axial fractures

The "north test pit" (test pit #1) at Fran Ridge, Yucca Mountain, Nevada has been inspected and could be used as a possible sampling site. Discussions concerning the mapping work to be done in this pit, still indicate that this work will not be completed during FY93 due to funding constraints. However, work could possibly be done in the pit with the approval of the sites in

the pit from the mapping group. Funding constraints prohibit considering any field work in the pit until FY94.

Variances:

3GUS015J Complete journal paper: detailed moire

Progress continues on this draft. The draft of the first two sections (classic moire and stereoviewing approaches) is being drafted by G. Severson.

SCP 8.3.1.2.2.4.2 Percolation testing in the ESF 0G33124B93

Summary Account Manager - F. Thamir

Technical Activities:

3GUS034B Prepare analytical report on imbibition experiments

A set of experiments that indicated that unsaturated flow rates in a fractured sample are significantly affected by bacterial and algae growths were completed. Also, the flow rate fluctuated and became unpredictable after the biological growth was observed. The types of organisms that caused the changes were not determined. This matter is important because bacteria does occur in the unsaturated zone; however, the types and concentrations in the Yucca Mountain region have not been studied thoroughly. The results from these experiments will be included in the report.

3GUS035B Plan and design ESF percolation test

Work on the new revision to the ESF percolation test study plan, SP 8.3.1.2.2.4.2, continues.

SCP 8.3.1.2.2.4.4 Radial borehole testing 0G33124D93

Summary Account Manager - G. LeCain

Planning and Operations:

3GUS0410 Design/construct/test borehole packer system

The proposal for bid on the radial boreholes testing equipment was submitted to the PI for review and returned to purchasing. The purchasing group estimates that a contract will be awarded in September, 1993.

Variances:

2GUS0410 Design/construct/test borehole packer system

The design, construction, and testing of the radial borehole testing equipment has been delayed due to budget restrictions that delayed authorization of the purchase for the first three months of the fiscal year, and purchasing regulations that require nine months to award the contract. This is nine months longer that the PI had allowed for purchasing and therefore the planned finish of this activity is pushed back nine months to March 30, 1994.

SCP 8.3.1.2.2.4.7 Perched water tests in the ESF 0G33124G93

Summary Account Manager - M. Chornack

Technical Activities:

3GUS012G Begin monitoring ESF for perched water

Monitoring for perched water in the starter tunnel by the USBR and LANL is continuing in conjunction with geologic mapping. To date 137 ft of tunnel has been completed by drill and blast methods. No natural water flows have been observed.

WBS 1.2.3.3.1.2.6 Gaseous-Phase Movement in the Unsaturated Zone

Principal Investigator - M. Chornack

SCP 8.3.1.2.2.6.1 Gaseous-phase circulation study 0G33126A93

Summary Account Manager - M. Chornack

Technical Activities:

3GGPO6B Plan tracer tests in selected UZ boreholes

Collected carbon dioxide samples for the fourth consecutive month and carbon 13/12 samples for the first time from Hilti holes near Yucca Mountain Crest. Carbon dioxide concentrations increased during spring and have been decreasing from a high of about 0.4 % to 0.2 % presently. Concentration data also indicate possible wind effects at the Hilti holes. (T)

3GGPO2B Collect UZ borehole data - FY93

The redesigned vertical downhole air flow instrument (VDAFI) collected flow measurements to 1170 ft in UE-25 UZ#16. The in-hole flow decreased fairly steadily from 0.73 m/s to 0.48 m/s in the upper 450 ft of hole, which has a fracture density of greater than 5 ft. The flow decreased more slowly to 742 ft through the middle nonlithophysal, which has a fracture density of less than < 5 ft. The flow decreased from 0.42 to 0.22 m/s between 742 and 1075 ft (fracture density greater than 5 ft). The flow dropped off to near 0.0 between 1112 ft and 1170 ft. in the vitrophyre. There was no flow to the hole below 1170 ft.

Downloaded flow and temperature data from the USW UZ-6s data logger.

3GGPO4B Tabulate and analyze gas samples

Received most of the Carbon 14 and Carbon 13/12 results from the SMU radiocarbon lab for the March 1993 USW UZ-6, USW UZ-6s, and neutron access boreholes sampling trip. These results are similar to past results from these boreholes. It was the first time sampling was done at USW UZ-13. Carbon 14 results from USW UZ-13 indicates the presence of old gas (55 % Modern) from below the densely welded Tiva Canyon.

Work Performed but not in Direct Support of the Scheduled Tasks:

Discussed with C. Johnson (M&O), the need to look into the potential of the proposed Nye County boreholes to provide a site to collect gas phase circulation data. (0.5 hrs)

WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry

Principal Investigator - A. Yang

SCP 8.3.1.2.2.7 Unsaturated-zone hydrochemistry LOE Account 0G33127Z93

Summary Account Manager - A. Yang

Conduct information seminars on model for project staff:

D. Thorstenson prepared and presented two informal seminars on PHREEQE geochemical modeling which was attended by all UZ-hydrochemistry technical staff. He gave practical examples of water-mineral interactions and the resulting water chemistry solved by PHREEQE.

Procure test borehole sampling system (12" hole):

Worked with contracts officer for SEAMIST for 2 hours. Worked for 36 hours with USBR and REECO personnel at the Mercury Truck shop on the packer handling system.

Began preparation of the packer tubing bundles for the UE-25 UZ#16 packer system.

Modifications to the flatbed trailer were started for the UE-25 UZ#16 packer work. Assisted REECo with erection of the gantry and positioning and mounting the hoist and winch.

Prepare hydrologic procedures, FY93:

HP-268, R0, Method for Core Preparation for Pore-Water Extraction by One-Dimensional Compression Methods, by J. Higgins is undergoing QA review.

C. Peters and G. Rattray reviewed HP-260 and HP-265 respectively.

Support project operations, FY93:

A. Yang attended the two day meeting on responses to QMP-8.01, R3 comments. This QMP addresses the control of non-conformance samples.

A. Yang contacted D. Teppel of the USGS subdistrict office in Ithaca, NY for detail to the Yucca Mountain UZ-hydrochemistry project at the NTS from July 12 to September 30, 1993. She has accepted the offer and cleared it with her supervisor. She will be working on the tracer injection and monitoring at the drilling site.

G. Davidson, a graduate student, from the University of Arizona was in Denver to learn the pore-water squeezing techniques. M. Beasley trained him on the operation of a first generation one-dimensional compression test and the handling, care, and safety of the cell. Davidson borrowed one of the first generation cells to take back to the U of A for his core squeezing work. Beasley packed the cell for shipment.

J. Higgins discussed one-dimensional compression testing with G. Davidson by phone prior to his visit. M. Beasley gave Davidson advice by phone on sources of materials required to run tests.

C. Peters, A. Yang, and G. Rattray attended the two day Underground Worker Training course. All personnel who need to access the ESF underground are required to take the course.

A. Yang and J. Ferarese attended the half-day Procurement Workshop.

A. Yang attended the Definition for SES Software meeting, which was to define which software should be included in the SES.

D. Thorstenson participated in a two day software QA meeting.

All UZ-hydrochemistry personnel prepared monthly status summaries. J. Higgins and A. Yang compiled and edited the monthly report.

A. Yang, C. Peters, and J. Higgins met with HIP management to discuss UZ-hydrochemistry personnel needs at present and for the future.

C. Peters researched the status of computer and chemical analysis contracts.

C. Peters conducted field work planning and tracer injection discussions with staff.

C. Peters held discussions with QA personnel concerning Scott Gas, an old NCR, TDIFs, and tracer injection.

C. Peters and G. Rattray completed a two-hour computer security training reading assignment.

UZ-hydrochemistry staff met with S. Buchanan to discuss the data management system for sample tracking.

D. Appel, D. Gillies, K. Scofield and C. Peters investigated the USBR Cold Room for core storage. It was established that the USGS paid for installation of the facility and should be entitled to use the storage space.

C. Peters had discussions with B. Newman (LANL) concerning his modeling of the extended dry concept chemistry. He is interested in non-zeolitized squeezed water chemistry. Peters has begun checking into what data we have available.

C. Peters held discussions with NVOP personnel concerning core requests, ESF grout issue, NRG borehole information, SF₆ target concentrations, tunnel boring machine, ESF information (movement of the N-S tunnel, etc.) and the surface based drilling program.

All UZ-hydrochemistry personnel completed assigned QA readings.

M. Beasley demonstrated the high-pressure one-dimensional compression test for Dr. J. Ryan, University of Colorado.

A sulfur hexafluoride standard was procured for use in the mobile van. Carbon dioxide and methane standards and regulators were procured for use in the UZ-hydrochemistry lab.

J. Ferarese answered auditors' questions during the June audit by DOE/Las Vegas on balance calibrations.

The date of the renovation of the UZ hydrochemistry lab in building 56 has been delayed to July 19, or the first part of August. It has been decided that the room next to the UZ Lab will be used for temporary operations during the renovation. Ferarese will require help from UZ staff in effecting this move.

G. Rattray prepared requisition for Leakmeter 125, spare and replacement capillary nozzles, and CR21X datalogger.

G. Rattray prepared a memo to K. Stetzenbach stating that there was not a surplus crushed Yucca Mountain tuff; however, he would be able to get Yucca Mountain core samples.

K. Scofield prepared the walk-in refrigerator (White Room) for UE-25 UZ#16 and USW UZ-14 core samples. Met with USBR personnel to determine the amount of space that will be available to our project. Began designing shelves that will be used for storing core in the White Room.

J. Higgins had separate meetings with three visiting university research professors on the design and testing of the one-dimensional compression cells.

SCP 8.3.1.2.2.7.1 Gaseous-phase chemical investigations 0G33127A93

Summary Account Manager - A. Yang

Technical Activities:

3GUH011 Evaluate existing export models gaseous C-14 export

An attempt was made to formulate equations for the distribution of carbon 14 in aqueous and solid phases.

A manuscript on "Gaseous-phase isotopic and chemical-composition data from Test Hole 1, UZ-1", by A. Yang and others, was edited.

3GUH012 Prepare, analyze and tabulate data

Carbon 14 data from the March, 1993 field work on USW UZ-6 and USW UZ-6S boreholes was analyzed and tabulated.

Gas samples from the UZ-1 borehole were collected on four occasions and analyzed for SF₆ to determine if the concentrations change during the drilling of USW UZ-14 (approximately 100 ft to the west of UZ-1).

3GUH013 Oversee drilling/collect gas and water vapor

The TDIF for work through May at the UE-25 UZ#16 and NRG holes is in preparation.

Conducted gas injection and monitored SF₆ tracer gas in boreholes USW UZ-14 and NRG4.

Variances:

3GUH016 Write monitoring gas tracer WRIR

Cause: RSN did not complete the installation of the automated tracer injection system until June, 1993.

Impact: Delay in writing the report will not affect the tracer monitoring operation.

Corrective action: None. Delays are outside our control.

Work Performed but not in Direct Support of the Scheduled Tasks:

An estimated 116 hours were spent in the following tasks:

The Chrompac gas chromatograph and data acquisition system arrived and installation by a Chrompac engineer is scheduled in early July. (2 hrs)

The cation column, for use in the Dionex DX-100 ion chromatograph arrived. A Dionex engineer installed the column, and it was discovered that the pump on the Dionex was not delivering the proper volume of eluent. The engineer ordered and installed a new pump at no charge. J. Ferarese is devising methods for anion analysis, which will cover the expected range of squeeze samples. The initial work done on anion methods development had to be repeated due to improper pump operation. (50 hrs)

Continued testing the adsorption of CO₂ onto dry and partially saturated (50% by weight) crushed tuff; and began testing adsorption of CO₂ onto solid cores. (20 hrs)

Monitoring tracer gas injection at USW UZ-14 was improved by programming the auto-injection system and the delayed injection of tracer gas was corrected. A second program was written to store the date, time, and drilling of tracer flow information in the data base. Wellhead pressures now are being stored in the data base per request from DOE/RSN/RECo. (40 hrs)

The analytical sensitivity of potential tracer gas, HFC-134a, on the gas chromatograph was rechecked with an electron capture detector. (4 hrs)

SCP 8.3.1.2.2.7.2 Aqueous-phase chemical investigations 0G33127B93

Summary Account Manager - A. Yang

Technical Activities:

3GUH030A Transport, prepare, extract and analyze core

Thirty three cores from the USW UZ-14, between 0 and 500 ft in depth, were shipped to the

UZ hydrochemistry project in Denver from the SMF in Nevada.

All of the core and water samples were inventoried for storage in the cold room. Seven distilled waters from borehole USW UZN-55, ten waters from borehole UE-25 UZ#16, and two waters from cuttings from hole UZN-33 were prepared and analyzed for tritium content.

Eight USW UZN-55 distilled waters and seven UE-25 UZ#16 distilled waters were packaged and delivered to the NWQL for stable isotope ratios.

The Packard liquid scintillation counter (LSC), used for screening high-tritium samples, required repair. A Packard service representative ordered a part and was able to repair the counter, it is working albeit noisily.

The LKB LSC was calibrated. Analytical balances also were manually calibrated with check weights.

Pore-water was extracted by distillation on 80 samples from UE-25 UZ#4, UE-25 UZ#5 and USW UZN-55. Eleven core samples from UE-25 UZ#16, ten of which, previously had been squeezed using one-dimensional compression methods, were sent for Oxygen-18, and D/H analyses.

Collected water vapor samples in the White Room to be analyzed for tritium content, to establish whether the room is contaminated before storing USW UZ-14 samples.

Seven Calico Hills core samples from UE-25 UZ#16 were compressed by one-dimensional compression methods and water was obtained for analysis. Also, compression records were updated and the mechanical data was entered into the data base files.

C. Peters prepared a list of UE-25 UZ#16 water chemistry priorities and how to handle samples.

3GUH037A Prepare report rubble collection and coring

No progress was made this month due to the UE-25 UZ#16 packer and gas-phase circulation work.

Work Performed but not in Direct Support of the Scheduled Tasks:

An estimated 64 hours were spent performing the following tasks: new additions for the distillation system were designed and the necessary supplies were procured (8 hrs); two more distillation systems were set up and a University of Colorado graduate student volunteer was trained on the use of the system (24 hrs); and the ground water collected from UE-25 UZ#16, UZN2, and UZN46 was filtered for chemical analyses (32 hrs).

WBS 1.2.3.3.1.2.8 Fluid Flow in Unsaturated Zone Fractured Rock

Principal Investigator - L. Anna

LBL Principal Investigator - G. Bodvarsson

SCP 8.3.1.2.2.8.1 Development of conceptual and numerical models of fluid flow in unsaturated, fractured rock 0G33128A93

Summary Account Manager - L. Anna/E. Kwicklis

Technical Activities:

3GUF026 Model imbibition experiments

A report is in preparation.

3GUF020 Conduct scoping and bounding calculations

Continued to develop techniques to calculate the fracture porosity from the measured total porosity and the acoustic properties of rock; and continued to search Yucca Mountain literature for the total porosity and the acoustic properties of rock data. The liquid water flux rates, are being calculated from water saturation and water potential profiles from four surface based borehole data. Because the initial phase of this work was successful, it is planned to investigate other surface based boreholes for similar information.

3GUF022 Model large block percolation experiment

Data collection for the large block percolation experiment was terminated in January. The transformation of the large volume of data as input into the numerical model has begun. Formulation of the modeling strategy began and experimenting with the model runs, using hypothetical data and two different single fracture models to determine which method gives the best results.

3GUF027 Adapt fracture network model to UZ flow

A contract with Golder Associates has been finalized to help and advise the USGS on adapting a fracture network model to UZ flow. Initial discussions have begun between the USGS and Golder to define strategies and goals. L. Anna attended a one week training workshop on Golder's FracMan code. The code has been adapted to the USGS computer systems. As part of the conceptual design of this activity, data will continue to be compiled as well as information about fracture orientation, dip, frequency, density, orientation and flow rates in differential stress regimes, and fracture characterization at different scales. This information will be included in the formulation of the fracture network model.

L. Anna and E. Kwicklis examined UE-25 UZ#16 and USW UZ-14 core samples to view fracture characteristics, orientations, and mineralogy.

Variations:

3GUF026 Model imbibition experiments

This activity has been delayed because the imbibition experiment has been changed. Changes include a new non-fractured sample and continuous data collection instead of periodic collection. The change of technique will give more meaningful information when comparing numerical simulation. Also, the large block percolation experiment had syphoned manpower and computer systems support from the imbibition test; however, data collection from that activity is now complete.

3GUF022 Model large block percolation experiment

This activity did not finish as scheduled, because there are still large volumes of data from the block that has not been interpreted from activity 8.3.1.2.2.4.2. Reports from each activity (3GUF022 & 8.3.1.2.2.4.2) will be combined into a composite report. There is no impact from the short delays of these nor on future studies.

Work Performed but not in Direct Support of the Scheduled Tasks:

L. Anna has begun compiling information on bulk permeabilities and/or transmissivities of fractured rock reservoirs on a world wide basis. Most of the data comes from analyzing production and pressure changes with time (in years). Three of the six reservoirs researched to date, are in fractured volcanic tuffs. The objective is to determine some possible ranges of bulk permeabilities/transmissivities in fractured rock using very long term "pump" tests. (25 hrs)

SCP 8.3.1.2.2.8.1L Development of conceptual and numerical models of fluid flow in unsaturated, fractured rock 0B33128A93

Summary Account Manager - G. Bodvarsson

Technical Activities:

3GWM18CA Study outcrop fracture bias and prepare report

The turning bands method was used to simulate permeability fields on a grid in three dimensions. The covariance structure for the permeability field is isotropic and exponentially decaying. Based on the permeability field, flow through the grid is determined using TRINET. The flow calculated with TRINET will be compared for two cases: an isotropic permeability field and an anisotropic permeability field. The latter will be anisotropic in the z-directions (elevation) and isotropic in the x-y plane.

3GWM21CA Complete TRINET users manual

The tutorial section of the TRINET user manual is nearly completed.

3GWM23CA Study prediction error and design test

A first draft of a journal paper titled "*Using the jackknife, the bootstrap, and cross-validation with spatially dependent data*" by A. Mauldon, K. Karasaki, and P. Witherspoon has been completed.

WBS 1.2.3.3.1.2.9 Site Unsaturated Zone Modeling and Synthesis

Principal Investigator - E. Kwicklis

LBL Principal Investigator - G. Bodvarsson

SCP 8.3.1.2.2.9.1 Conceptualization of the unsaturated-zone hydrogeologic system 0G33129A93

Summary Account Manager - E. Kwicklis

Technical Activities:

3GUM002a Develop conceptual models of UZ - FY93

Revisions to the manuscript entitled "*Numerical investigation of steady liquid water flow in a variably saturated fracture network*" by E. Kwicklis and R. Healy were completed and the paper accepted by Water Resources Research.

The literature review of papers recently published in the proceedings of the Third High-Level Waste Management Conference was continued in order to remain current on what has been observed concerning the geochemistry, geologic structure and hydrology of the unsaturated zone at Yucca Mountain.

In preparation for the two-dimensional cross-sectional simulation of Pagany Wash, a one-dimensional model was constructed with stratigraphy representative of UE-25 UZ#4 and UE-25 UZ#5. The one-dimensional model is being used to assess the ability of the code (VS2DT) to do 2-dimensional simulations and provide a basis for comparison between a one-dimensional steady flow model and a two-dimensional transient model.

Work Performed but not in Direct Support of the Scheduled Tasks:

Approximately 40 hours were spent preparing for and delivering a presentation entitled "Comparison of dual-porosity and effective continuum approaches to thermal modeling" at the Performance Assessment Thermal Modeling meeting.

Approximately 16 hours were spent reviewing a journal article for Water Resources Research.

Approximately 40 hours were spent adapting the recently purchased TOUGH2 numerical simulator to run on the NHPSUN; however, more work is needed.

SCP 8.3.1.2.2.9.2L Selection, development, and testing of hydrologic-modeling computer codes
0B33129B93

Summary Account Manager - G. Bodvarsson

Technical Activities:

3GUM20L Prepare report on grid effects

Computer runs were made on a two-dimensional cross section from the three-dimensional site-scale model using a much finer grid spacing. The computer runs were made using different assumptions regarding infiltration rates. The results will be compared to those obtained using the coarse grid, especially the distribution of saturations and capillary pressures.

3GUM32L Complete moisture flow report

A draft of the moisture flow report is complete and has been forwarded to two internal reviewers at LBL. Given the length and complexity of the report, it is expected that the reviews will take about two months.

3GUM15L Complete study plan resolution

LBL's work on study plans has been completed.

3GUM35L Evaluate gas-flow data/develop gas component in model

Work was begun on the evaluation of gas-flow data for the site-scale model. Several papers and reports on gas flow at Yucca Mountain have been reviewed.

Variations:

3GUM32L Complete moisture flow report

As explained in the memo from D. Gillies of June 25, a report is not complete until it is submitted to DOE. It is expected that complete internal review, the resulting revisions and review by USGS can be completed by the end of September, 1993.

SCP 8.3.1.2.2.9.3L Simulation of the hydrogeologic system 0B33129C93

Summary Account Manager - G. Bodvarsson

Technical Activities:

3GUM009L Revise study plan/resolve comments

LBL's work on study plans has been completed.

3GUM12L Prepare TOUGH testing report

The writing of the decoupled TOUGH testing report continued with the writing of a section on sample problems of water flow to drains.

Work Performed but not in Direct Support of the Scheduled Tasks:

Various modifications and insertions were installed in the QMP.

Various staff members completed QA reading assignments.

WBS 1.2.3.3.1.2.10 Prototype Hydrologic Tests that Support Multiple Site Characterization Activities

Principal Investigator - M. Chornack

Prototype Cross-Hole Testing 0G3312AC93

Summary Account Manager - G. LeCain

Technical Activities:

3GUT004 Prepare open file report on ALTS testing & analysis

The PI continues to incorporate the in-house reviewers comments and suggestions into the ALTS report.

Variations:

3GUT004 Prepare open file report on ALTS testing & analysis

The completion of the prototype reports has been delayed because of a shortage of PIs. This staff shortage has meant that scientists are acting PIs for several studies, consequently the report work is usually given a low priority.

Prototype Tracer Testing 0G3312AD93

Summary Account Manager - A. Yang

Technical Activities:

3GUT016D Prepare WRI report on gaseous tracer tests

Continued literature research of aqueous and gaseous tracer experiments and modeling of results.

Prototype Pore-Water Extraction 0G3312AG93

Summary Account Manager - A. Yang

Technical Activities:

3GUT050G Evaluate and analyze chemistry and compress techniques

The data base was updated to include all one-dimensional compression test physical data (water content, degree of saturation, quantity of water and gas extracted, strain obtained, etc.).

3GUT052G Prepare OFR on pore-water chemistry vs pressure data

C. Peters was busy on the gaseous phase project this month, and therefore was unable to spend time on this task.

It has been decided that the OFR will be primarily a data report, so the USGS required format for text and tables for an OFR was researched and the planning of the text and the design of the data tables was begun. The part-time addition of S. Buchanan to help with computer data management should be helpful in producing the data tables and graphs required for the report.

3GUT053G Prepare journal paper on development of 1-D compression

The data tables and graphs were designed and the data base files are being transferred to Wordperfect, so that the tables can be produced.

Variations:

3GUT050G Evaluate and analyze chemistry and compress techniques

3GUT052G Prepare OFR on pore-water chemistry vs pressure data

As reported previously, there is a lack of personnel to accomplish the required one-dimensional compression experiments and data analysis and modeling of chemical results for this task. The staff critical to accomplishing this task on time have been off the project since September 30, 1992. S. Buchanan will be helping part-time with data input and production of data tables and graphs for the OFR, so that 3GUT052G should be completed by September 30, 1993. The project is still in need of someone to do data analysis and modeling for 3GUT050G.

Work Performed but not in Direct Support of the Scheduled Tasks:

J. Higgins and M. Chornack investigated the possibility of obtaining an agreement with the USBR to use the load frame in the USBR vibration laboratory for one-dimensional compression testing (a second load frame is required for production testing). However, the USBR has removed the lab from use for one year for building renovations; therefore, the USBR lab is not available for our use. Other possible load frames that can be used for one-dimensional compression tests are located in laboratories in Brown Hall at Colorado School of Mines, appear to be possibilities. The Mining Engineering Department has one machine with 600,000 lb compression capacity and another with 1,000,000 lb compression capacity, both computer controlled. Higgins will meet with the Department Head in early July to discuss the equipment capabilities and a possible agreement on use of the equipment and lab space. Also, Higgins met with H. Olsen (USGS) who is in charge of the joint CSM/USGS Geotechnical and Engineering Geology Laboratory facility (located next to the Mining Engineering Labs). Olsen has one load frame that might be used. Olsen and Higgins checked the load frame, pumps, and plumbing, and calculated pressure capacities. The hydraulic plumbing needs some repair. The machine pressures are manually operated, but it appears that it could be set up to be operated by a PC. Manual operation of a 1-D test is possible, but computer operation is highly desirable if only one person is to run a test. The machine would need to be set up and tested by Olsen and Higgins to make certain that it would meet the needs. This option will be investigated further if an agreement can not be made with Mining Engineering. (7 hrs)

WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-Water Flow System

Principal Investigator - M. Umari

SCP 8.3.1.2.3.1 Site saturated-zone ground-water flow system LOE Account 0G33131Z93

Summary Account Manager - R. Luckey

Site Potentiometric-level Evaluation (8.3.1.2.3.1.2)

P. Tucci performed routine project operational tasks, including scheduling and coordinating of field operations to maintain the water-level monitoring network, overseeing of project budget items and spending, preparing personnel actions, attending section meetings, meeting with project personnel, and other miscellaneous administrative and operational tasks.

M. Boucher lent QA support to various activities, evaluating QA and organizing QA support for other groups of activities.

Field personnel worked on repairing and calibrating the multiconductor cable unit used to obtain water-level measurements.

G. O'Brien researched the possibility of obtaining a new depth counter for the multiconductor unit.

P. Tucci attended meetings concerning geophysics integration (June 8) and the workscope consolidation for planned deep wells (June 17); and he attended a training class for Procurement (June 2).

P. Tucci and M. Boucher participated in a verification activity (VA) 93-03 for SCP activity 8.3.1.2.1.4.4.

P. Tucci met with a group of visiting scientists from Czechoslovakia, to discuss the USGS use of surface geophysics in ground-water resource and contamination studies. The visitors were interested in electrical methods to detect shallow targets.

M. Boucher participated in the DOE audit YMP-93-10, in Denver and at the NTS.

P. Tucci, G. O'Brien, and M. Boucher met with the COU to discuss problems with water-level data being sent by satellite to ADAPS. In order to avoid the overwriting of good transmissions with poor transmissions the data will be transmitted to the LRGS for processing into ADAPS.

G. O'Brien showed D. Winegarden the NTS procedures and machine shop facilities. Also discussed were possible modifications that can be made to improve and maintain existing water-level monitoring network equipment.

G. O'Brien sent the corroded weight that had been in USW G-2, to LLNL for analysis to try to find what could be causing transducer failures.

Saturated-zone Fractured-rock Hydrology (8.3.1.2.3.1.3)

Support Project Operations

M. Umari prepared the monthly PACS report for June 1993; tracked spending under accounts 4889-12001, -12002, -12005, and -12006; finalized and transmitted the (April 1, 1993-March 31, 1994) work plans for G. Patterson, J. Gemmell, J. Earle, and A. Geldon; and prepared position descriptions (PDs) for Patterson and Gemmell, that resolve discrepancies between their current work plans and PDs.

Plan and schedule project operations

G. Patterson and R. Luckey attended a c-holes-testing coordination meeting in Las Vegas, at which point it appeared that all the pieces were in place to start the cross-hole hydraulic testing at the c-holes in July 1993; however, on June 22, 1993, B. Sublette (SAIC - Las Vegas, T&MSS) informed M. Umari that C. Newbury, DOE WBS Manager for Hydrology, has made the decision against conducting any cross-hole hydraulic testing at the c-holes in July 1993 (which would involve the cumbersome process of trucking the pumped water away), in favor of awaiting the completion of the discharge pipeline (which will carry the pumped water to Forty Mile Wash) in November 1993.

An interim plan has been developed to conduct non-pumping tests at the c-holes until the discharge pipeline is completed. The interim plan involves monitoring for hydraulic effects of barometric pressure changes with open-holes, and packer-string-instrumented holes with packers uninflated. The plan takes advantage of REECO drill-crew availability that had been scheduled to set up the pumped cross-hole hydraulic tests.

Participate in training

G. Patterson, J. Earle, J. Darnell, and J. Gemmell attended a half-day workshop on the use of the Keithley data acquisition hardware, some of which (specifically a multi-meter and a multiplexer) had been purchased by the SZFRHP for the upcoming cross-hole testing at the c-holes.

Prepare for and attend technical, QA, and administrative meetings

M. Umari attended a meeting on to define exactly what is meant by "Scientific and Engineering Software", which is relevant to the revision of the Software-QA QMP-3.03 from Rev. 3 to Rev. 4.

Do administrative and operational tasks

G. Patterson prepared and submitted a request for pre-approval of overtime work, anticipated after the commencement of cross-hole testing at the c-holes, for Patterson, J. Gemmell, J. Earle, A. Geldon, and J. Darnell.

J. Gemmell, J. Earle, and J. Darnell made the final preparations to ship various components of the multi-zone packer string to the NTS, some from Denver and some from Raymond. The shipping may involve contracting for a driver from the USBR, and for a tractor - (flat bed) trailer shipment. Most of the string components will be shipped despite the delay in commencement of the pumped cross-hole hydraulic tests at the c-holes.

Work at the Raymond Quarry site, which is being used to prototype the c-holes-bound packer string: G. Patterson, J. Gemmell, J. Darnell, J. Earle, and M. Umari went to the Raymond site and placed the two packer strings that had been pulled out of holes SW2 and SE2 in May 1993 (to allow for conducting bore-hole radar surveys) back in the holes; Patterson, Earle, and Darnell went back to the Raymond site to fix a leak that developed in the packer-inflation-line for the top packer installed in well SW2 the week before. The leak was determined to be the result of a pin-sized puncture in the steel-reinforced rubber inflation-line, which is most-likely a manufacturing defect. This alerted us to the need for testing all packer-inflation-lines prior to deployment in the c-holes where the large depths of the holes would make it very time consuming (and therefore costly) to fix such a problem after the packers are deployed.

Oversee LBL's effort to complete analysis of seismic profile

E. Majer (LBL) sent a seismic wave amplitude-attenuation map, and an improved (over a previous preliminary version) velocity map for the C2-C3 tomograph. The final report from LBL, that would explain the details of how these maps were obtained and their underlying assumptions, as well as integrate the information with geologic and geophysical information, previously provided to Majer by A. Geldon.

Convert scientific notebook to technical procedure

The SN for the field simulation of the c-hole testing, which was approved in February 1993, will be used for the initial stages of the actual testing at the c-holes (starting date for the tests has been delayed from July 1993 to November 1993), and as such, the conversion to a technical procedure is not imminent. Such conversion will take place only after conducting cross-hole testing for a long enough period of time, and acquiring enough experience with the process, to be able to articulate the methodology specifically enough for a technical procedure.

Develop software QA for analysis programs

All, except one, of the software applications are in the developmental stages in the SZFRHP, and are exempt from full Software QA stipulations according to the ACSR YMP-USGS-ACS-G1233131-1, R0. The only possible exception is the program for automated data acquisition that is being partly contracted out to a software engineering design firm. This program may have to be entered into the Software QA process upon receipt from the vendor. However, an alternate approach may be to modify the already-approved SNP to include documentation of the program.

Develop scientific notebook for (hydraulic and) tracer tests

The SN for the field simulation of the c-hole testing was approved in February 1993. This SN is discussed further under "Convert Scientific Notebook to Technical Procedure" above.

Begin 1993 water-level data collection

Routine tasks completed in this reporting period: monitored 17 zones in 17 wells on a monthly basis; monitored 18 zones in 12 wells on an hourly basis; obtained real-time data on 18 zones in 12 wells using DCPs (included in the count of hourly sites above; evaluated the status of the network at the end of each month; and monitored real-time data on a daily basis, looking for water-level excursions and equipment malfunctions.

Continuous analog data was obtained from 4 zones in two wells (included in the count of hourly sites above) in order to monitor water-level responses to earthquakes and UNEs. Several earthquakes occurred in the Region and near Yucca Mountain on May 17-19. These earthquakes had a maximum magnitude of about 6.0 (near Bishop, California), but most were less than magnitude 5.0. Water-level and fluid-pressure responses to the earthquakes generally were small scale and of short duration (less than one hour).

Special tasks completed in this reporting period: calibrated the transducers at the following wells - USW WT-11 and UE-25 WT-13, USW H-6 upper and lower intervals; replaced the transducers at the following wells: USW WT-11; and the Multiconductor cable unit was calibrated, as well as the chart recorder and the data logger at USW H-6.

A water-level measurement was obtained in well UE-25 UZ#16 on June 2. Water levels appear to be stable, at a depth of about 1,605 ft below the ground surface. New measuring point elevations were obtained.

All hourly water-level monitoring is being done through the LRGS system in Denver, in order to get higher quality data acquisition. To receive better signals to the satellite, antennae were realigned at wells USW H-5, UE-25 WT#13, USW H-6, USW WT-11, USW H-1, WT-1, H-4, p #1, USW H-3, USW G-3, and UE-25 WT#3. Other wells will be done later.

D. Burkhardt input all steel-tape and electronic tag water-level measurements through 1988 into GWSI.

Reduce 1992 transducer calibrations

All of the WT series wells are now completed for 1992

SCP 8.3.1.2.3.1.2 Site potentiometric-level evaluation 0G33131B93

Summary Account Manager - P. Tucci

Technical Activities:

3GWF064A Complete 1990-91 water-level report

Water-level data for all wells has been reviewed for inclusion in the report; water-level data for the WT-holes were edited, using review comments. Previous drafts of the report were revised and edited in response to review comments by R. Luckey. Began revising and updating tables which need to be converted to wordperfect format.

3GWF025A Reduce 1992 water-level data

The reduction of all 1992 periodic water-level data has been completed, and checked. Water-level data for well USW VH-1 was revised, because of an error in the height of the measuring point. New information concerning reference point elevations for wells J-11, J-12, and USW VH-1 was obtained by Nevada District personnel as part of the environmental monitoring program, and this data is being reviewed before inclusion to our data base.

3GWF053A Preparation for drilling WT-23

P. Tucci and G. O'Brien went to the field on June 9th to verify the previously staked location of planned wells WT-23 and WT-24, and determined the correct location on topographic maps. Tucci and O'Brien also attended a work consolidation meeting for drilling of new deep wells; one of the outcomes of this meeting was a proposal to consolidate wells WT-23 and WT-24, depending on what is found in well USW UZ-14 (currently being drilled).

G. O'Brien obtained latitude and longitude locations of WT-23 and WT-24 using a portable GPS

unit.

3GWF044A Begin preparation of 1992 water-level data report

The table of contents, list of figures, and list of tables have been compiled for the planned report. This report will be in the same format as the 1990-91 report, and many of the tables from the 1990-91 report will be directly usable in the 1992 report.

Work Performed but not in Direct Support of the Scheduled Tasks:

P. Tucci reviewed a draft of QMP-3.04,R5. (8 hrs)

G. O'Brien set-up a comparison test of field barometers at the HRF, and performed a calibration check of field barometers in the calibration lab at the HRF using new procedures. (12 hrs)

G. O'Brien worked on the analysis of the effects of the June 3, 1993 earthquakes on water levels in the Yucca Mountain area. Only very minor and transient changes in water level were found. (16 hrs)

G. O'Brien worked on installing new programs for data loggers to more accurately monitor water-level changes associated with earthquakes, and installed the new storage modules at wells USW H-5 and USW H-6. (40 hrs)

G. O'Brien reviewed data and analyzed problems with several wells used to continuously monitor water levels, and worked with personnel at NTS to correct the problems. (40 hrs)

Status of approved reports awaiting publication

The text of the approved report "*Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1985-88*" is at the Colorado District for final formatting and processing. Galley proofs were reviewed by the authors this month.

The report, "*Water levels in continuously monitored wells in the Yucca Mountain area, Nevada*", by D. Lobmeyer and D. Luckey received USGS approval, DOE concurrence, and was sent to Colorado District for final manuscript preparation for publication.

The report, "*Precision and accuracy of water-level measurements taken in the Yucca Mountain area, Nevada, 1988-90*", by M.S. Boucher received USGS Director's approval as a Water-Resources Investigations report 93-4025. The report received DOE concurrence and was sent to the printer in June.

The report, "*Earthquake-induced water-level fluctuations at Yucca Mountain, June, 1992*", by G. O'Brien received USGS Director's approval. The report was printed and distributed in June.

SCP 8.3.1.2.3.1.3 Analysis of single- and multiple-well hydraulic-stress tests 0G33131C93

Summary Account Manager - M. Umari

Technical Activities:

3GWF010D Complete intraborehole flow and stress test report

A. Geldon had completed a manuscript for the report in April. The manuscript was submitted for typing in May, and was typed in June. The report will be sent for colleague review in mid July. The completion date of the report is now projected to be October 1, 1993 (the date at which the report, having received colleague review, would be sent simultaneously for WRD Region/Head Quarters review, and for DOE concurrence).

3GWF008D Monitor/analyze strain-related pressure response

No progress in June, but plans have been developed to instrument the c-holes with pressure transducers only (i.e. without packer strings) in July 1993, at which time a simultaneous record of barometric pressure and water-level fluctuations will be collected. This will continue for a few weeks. In August 1993, it is anticipated that packer strings will be placed in at least two of the holes, but no pumping can be done until the discharge pipeline is completed. In the period that the strings are in the holes but pumping is not allowed, the packers will be left uninflated, and the simultaneous collection of barometric pressure and water-level fluctuations will continue.

3GWF004D Write journal article on the reanalysis of past c-hole aquifer tests

A. Geldon has been assigned to this task. Geldon will use his "*Intraborehole flow and stress test report*" as a basis for this article, which will be submitted for publication in the Proceedings of the October 1993 GSA meeting in Boston. Geldon wrote an abstract, which was reviewed and approved in May.

SCP 8.3.1.2.3.1.4 Multiple-well interference testing 0G33131D93

Summary Account Manager - M. Umari

Technical Activities:

3GWF007F Complete design memoranda - 5-zone packer string

The final agreement with the USBR, in the form of a task agreement (TA), stipulates that the USBR will document its design of the packer string system by design memoranda (DM). These DM also would include instructions on assembly of the string prior to field deployment. The final review and revision process of these DM were due to be completed by May 28, 1993.

J. Bowen, USBR, completed an initial draft of the DM in May. During June, J. Boernge (USBR), and J. Gemmill (USGS), performed a technical review of 5 of the DM package's 8 sections. During the first part of July, they will complete the review, and after that, it will be transmitted to the USGS by a formal memo from the USBR. This transmittal date is projected to be around August 1, 1993.

3GWF014F Develop techniques for (and begin) analysis of X-hole test results

Using the software package FracMan (by Golder Associates) to develop a 3-dimensional, fracture-network model for the c-holes (the model can be used for cross-hole test design, and analysis of the eventual cross-hole test results): P. Wallman and T. Dow (Golder and Associates) and E. Ervin discussed the FracMan fracture-network model of the c-hole complex. In connection with this modeling effort, Ervin requested T.V. logs, acoustic televiwer logs, and fracture data information from A. Geldon (SZFRHP). The plans are to model the first test planned for the c-holes, for which packer locations have already been selected, to provide "type curves" to match the test data against, thereby indicating the fracture connectivity between the wells.

Variations:

3GWF007F Complete design memoranda - 5-zone packer string

The DM package was scheduled to be reviewed and finalized by May 28, 1993. By that date, however, only an initial version of the package had been prepared by J. Bowen. Final transmittal of the DM package from the USBR to the USGS is projected to be around August 1, 1993.

The DM package is a sizable document representing a "users manual" for the multi-zone packer

system. The cause of the of the variance is incorrect estimation by J. Bowen. of the time needed to prepare and review such a document. The impact of receiving the finalized package by August 1, 1993 (or soon thereafter), rather than May 1993 is very minimal. The reason for this is because J. Gemmell has most of the information contained in the package in one form or another. Corrective action is not required at this time.

SCP 8.3.1.2.3.1.5 Testing of the C-hole sites with conservative tracers 0G33131E93

Summary Account Manager - M. Umari

Technical Activities:

3GWF169A Continue development of techniques for analysis of tracer test results

The HST code was run in May using the input file (representing a geohydrologic model of the cross-section between UE-25c #1 and UE-25c #3) that had been constructed in April. Initial problems with the format of the input file were resolved. The program aborted indicating that some machine-specific program statements (that Kipp had included to make the program run on his Mascomp workstation) would have to be removed. No work was done on this problem in June.

Using the software package FracMan (by Golder Associates) to develop a 3-dimensional fracture-network model for the c-holes (the model can be used for tracer test design and for analysis of the eventual tracer test results): P. Wallman and T. Dow (Golder and Associates) and E. Ervin discussed the FracMan fracture-network model of the c-hole complex. In connection with this modeling effort, Ervin requested T.V. logs, acoustic televiwer logs, and fracture data information from A. Geldon (SZFRHP). The plans are to model the first test planned for the c-holes, for which packer locations have already been selected, to provide "type curves" to match the test data against, thereby indicating the fracture connectivity between the wells.

3GWF170A Complete tracer injection system

A tracer mixing tank will be required at the surface during the tracer tests at the c-holes. \$5,000 have been earmarked for this purpose in FY93, and the isotope geology machine shop is the most likely candidate to do the work.

The completion date for the construction of the tank has been delayed from April 1993 to September 1993.

The downhole tracer injection system requires, in addition to the components already purchased from Baker, 1.66" O.D. pipe to deliver the tracer from land surface to the downhole system. This pipe will be requested from NTS contractors through a criteria letter.

WBS 1.2.3.3.1.3.2 Saturated Zone Hydrochemistry

Principal Investigator - W. Steinkampf

SCP 8.3.1.2.3.2.1 Assessment of saturated-zone hydrochemical data availability and needs 0G33132A93

Summary Account Manager - W. Steinkampf

Technical Activities:

3GWH001A Assessment of extant data, phase II

D. Perfect continued cluster analysis of the hydrochemical data base. Preliminary t-tests were run to test for separation of the nine cluster groups that were defined. Because the previously made ARC/INFO spatial plot of cluster data showed many values plotted on top of one another,

several smaller plots had to be made so that the cluster data could be viewed clearly. Basic statistics were determined for the hydrochemical parameters within each cluster group. Corresponding plots of cluster number versus average parameter concentrations were made, showing standard deviations. Using these and the spatial plots and the previously made lithology frequency plots and piper diagrams, the clusters were interpreted in terms of hydrochemistry. A preliminary report was written on the results of the statistical analysis of the hydrochemical data base and the methods used.

B. Steinkampf participated in a planning and review meeting with D. Perfect, K. Turner, and G. Closs to discuss progress of data assessment, and to discuss plans for future work.

Work Performed but not in Direct Support of the Scheduled Tasks:

B. Steinkampf revised D. Perfect's work plan and performed a supervisory review and assessment of her efforts, and discussed these results with D. Perfect and D. Luckey.

B. Steinkampf met with D. Appel, T. Chaney, M. Boucher, A. Handy, and W. Rodman to preliminarily discuss resolution of Steinkampf's review comments on a USGS quality-management procedure intended to provide a means to grade work activities. Steinkampf's comments on a procedure to control the use of scientific notebooks were also discussed.

SCP 8.3.1.2.3.2.2 Hydrochemical characterization of water in the upper part of the saturated zone

0G33132B93

Summary Account Manager - W. Steinkampf

Technical Activities:

3GWH006B Develop mobile lab and downhole collection equipment

T. Oliver performed preventive maintenance on the ion chromatograph system in the study laboratory in area 25 at the NTS. In the course of this work, Oliver determined that the anion column in use must be replaced.

Variances:

3GWH007B Incorporate hydrochemical tool test results

Test results are not yet available, as the tests have not been conducted. The start date for this task has therefore been tentatively rescheduled to September 1. It is uncertain if the tests will have been completed by this date. This delay has no impact on milestones and work efforts attendant to this activity.

SCP 8.3.1.2.3.2.3 Regional hydrochemical characterization 0G33132C93

Summary Account Manager - W. Steinkampf

Technical Activities:

3GWH905A Select sample sites - FY93

B. Steinkampf discussed alternate sampling sites in DVNM with W. Werrell (NPS/Ft. Collins). It was agreed that sample and data collection, at sites that do not have discrete and readily identifiable discharges, must be conducted to minimize the extent and visibility of site impact.

3GWH910 Collect/analyze/evaluate regional samples - FY93

B. Steinkampf and B. Newman (LANL) collected samples and field data at several springs in Death Valley National Monument. Samples were sent to USGS and other laboratories for chemical and isotopic analyses.

Work Performed but not in Direct Support of the Scheduled Tasks:

T. Oliver prepared procurement documents for: 1) a water purification system to be installed in an area 25 laboratory at the NTS; 2) miscellaneous sampling equipment.

B. Steinkampf convened a meeting with M. Ebinger and B. Newman (LANL), Z. Peterman, J. Paces, B. Marshall, and B. Parks, (USGS/GSP), and K. Ludwig (USGS) in Lakewood. The meeting objective was to provide participant investigators with an awareness of the scopes of and rationales for ongoing and planned hydrochemical and isotopic studies, in order to enhance communications between relevant scientists and to facilitate integration of investigator efforts and utilization of resultant information. (12 hrs)

WBS 1.2.3.3.1.3.3 Saturated Zone Hydrologic System Synthesis and Modeling

Principal Investigator - E. Ervin

LBL Principal Investigator - K. Karasaki

SCP 8.3.1.2.3.3.2L Development of fracture network model 0B33133B93

Summary Account Manager - K. Karasaki

Technical Activities:

3GUF217L Complete semi-analytical methods report

Two appendices have been added to the report on the semi-analytical dual-porosity model: one dealing with grid discretization and the other with a comparison between Brooks-Corey and van Genuchten sorptivities.

3GUF117L Analyze block-size distribution

An approximate expression for the Warren-Root alpha parameter; which governs the fracture/matrix interflow rate and equilibration time, has been developed. Several papers addressing the effect of block-size distribution, in the context of saturated flow or solute transport, have been collected from the literature. In general, a distribution of matrix blocks of different sizes will not behave precisely like some "equivalent matrix block" although this is what is needed to keep the mathematical model traceable. Studies aimed at optimizing the choice of the equivalent matrix block are continuing.

Variances:

3GUF217L Complete semi-analytical methods report

The report not finished. It does not adversely affect other tasks, as no subsequent task requires this completed report.

Work Performed but not in Direct Support of the Scheduled Tasks:

Various modifications and insertions were installed in the QMP and various staff members completed QA reading assignments.

WBS 1.2.3.6.2.1.1 Modern Regional Climate

Principal Investigator - B. Parks

SCP 8.3.1.5.1.1.1 Synoptic characterization of regional climate 0G36211A93

Summary Account Manager - R. Forester

Technical Activities:

3GCR005B Develop study plan

The study plan for this activity was completed and submitted to DOE on June 18, 1993.

Work Performed but not in Direct Support of the Scheduled Tasks:

R. Forester reviewed DOE document entitled "*Transition plan for SCP study 8.3.1.5.1.6. Future regional climate and environment.*" and reviewed a manuscript for Paleo-geography-climatology-ecology.

WBS 1.2.3.6.2.1.2 Paleoclimate Study of Lake, Playa, and Marsh Deposits

Principal Investigator - B. Parks

SCP 8.3.1.5.1.2 Paleoclimate study of lakes, playas, and marshes LOE Account 0G36212Z93

Summary Account Manager - B. Parks

Prepared schedules for tasks assigned to this activity. Provided status reports of planned activities and prepared variance analysis reports. Performed administrative duties and managed personnel.

SCP 8.3.1.5.1.2.2 Analysis of stratigraphy-sedimentology of marsh, lacustrine, and playa deposits

0G36211B93

Summary Account Manager - R. Forester

Technical Activities:

3GCL013B Collect cores

K. Conrad assisted DRI personnel in taking a core from Peter's Playa in southern Nevada.

3GCL016B Paleontological preparation/assessment

R. Forester and K. Conrad (USGS), with P. Wigand and M. Hemphill (DRI) studied and subsampled cores from Pahrump, Stuart, and Peter's playas.

K. Conrad participated in the study and subsampling of cores taken, to date, in southern Nevada and initiated the preparation of a TDIF for stratigraphic data collected from cores.

K. Conrad and J. Buchner processed samples and extracted ostracodes and other calcareous microfossils from fossil and modern samples taken in Nevada.

3GCL014B Stratigraphic analysis

General sediment and stratigraphic characteristics were identified, described, and submitted as a midyear report for this study. Approximately 900 samples were taken for microfossil, pollen, loss on ignition, and general sedimentological study. The general characteristics of the sediments in these cores suggest that each playa has behaved as a playa for what ever period of time is represented in the cores. Such behavior, if shown to be true, is unlike other playas to the north, such as Kawich, which sustained a lake throughout much of its history, and would indicate that climate records were not preserved at these sites.

WBS 1.2.3.6.2.1.3 Climatic Implications of Terrestrial Paleoecology

Principal Investigator - B. Parks

SCP 8.3.1.5.1.3.1 Analysis of pack rat middens 0G36213A93

Summary Account Manager - P. Wigand

Technical Activities:

3GCL110 Management oversight/scientific coordination

USGS personnel accompanied DRI personnel on a field trip to southern Nevada to collect cores and samples from Pahrump, Stuart, and Peter's playas.

WBS 1.2.3.6.2.1.4 Paleoenvironmental History of Yucca Mountain

Principal Investigator - B. Parks

SCP 8.3.1.5.1.4.2 Surficial deposits mapping of Yucca Mountain area 0G36214B93

Summary Account Manager - S. Lundstrom

Technical Activities:

3GCH039A Prepare report on FY92 study

This status report has been completed.

3GCH035A Airphoto/field check/sampling/analysis northern third YM

S. Lundstrom and M. Dailey field checked map units in Abandoned and USW WT-2 Washes on Sheet 21 and on Northern Yucca Mountain. In addition to normal mapping activity, Lundstrom met with W. Guertal at the HRF and in the field, to collaborate on the map unit identification of surficial deposits. That Guertal will be sampling to characterize surface infiltration properties. This will be beneficial to both the surficial mapping project and to the HRF program, because it will give the HRF program an estimate of the distribution of the units to be sampled, and the surficial mapping project will get the needed laboratory sedimentological data to characterize map units.

The map report on this third of Yucca Mountain is nearly ready for colleague review.

3GCH055A Airphoto/field check/sampling/analysis central third of YM

Airphoto interpretation and field checking of surficial deposits for this area continues to be an ongoing process. Analyses are being entered onto map products.

SCP 8.3.1.5.1.4.3 Eolian history of the Yucca Mountain region 0G36214C93

Summary Account Manager - J. Whitney

Technical Activities:

3GCH162C Write report on lead isotopic composition

This activity was completed.

WBS 1.2.3.6.2.2.1 Quaternary Regional Hydrology

Principal Investigator - R. Luckey

SCP 8.3.1.5.2.1 Quaternary regional hydrology LOE Account 0G36221Z93

Summary Account Manager - R. Luckey

Collect hydrologic data FY93

Continued data collection at the Stewart Creek and Kawich Creek analog recharge sites. The data collection system consists of two stream-flow sites, four meteorological sites, and six to eight water quality sites. On a daily basis, T. Oliver checked the NWIS data base for DCP data and performed weekly data pulls from the LRGS to fill missing data.

T. Oliver and M. Ciesnik conducted a sampling trip to the analog sites. Weather and surface water data were retrieved and water samples were collected. Sample collection reports were submitted to the YMP SMF.

T. Oliver worked up the precipitation charts from the sample trip and submitted them to P. McKinley for review.

T. Oliver entered the data from the trip into the NWIS data base.

Support project operations

During this reporting period, the PIs responsible for this study planned, scheduled and monitored routine project operations, prepared routine procurement documents, monitored rate of spending, and held or participated in routine administrative meetings.

E. Gutentag conducted a field sampling trip to the northern portion of the Nellis Air Force Base Bombing Range from June 1 to June 7. Playas and springs in the area were sampled. J. Watson submitted the water samples to the NWQL for analysis and sample collection forms to the YMP SMF.

E. Gutentag and J. Watson were present for the DOE/YMQAD 93-10 Surveillance at the NTS and USGS HRF on June 29. The surveillance covered Criteria 12, "Instrument calibration". At the NTS specifically, operator-to-calibrate equipment assigned to Gutentag were looked at and evaluated.

During the reporting period, the QA specialists involved in this study monitored all project activities for QA compliance, tracked all open items, and attended QMP training sessions and bi-weekly USGS-HIP SZ QA meetings. Special tasks and items included: J. Watson performed reviews of QMP-3.07 and QMP-12.01; Watson performed location and ostracode data verification for an ostracode related report written by E. Gutentag; Watson attended pre and post-DOE/YMQAD DOE Audit 93-10 meetings on June 14 and June 18th respectively; and Watson attended the QA Open Items meeting on June 30.

USGS-NCR-93-12: QA office awaiting response from the GAC following a letter sent addressing the status of current ACSR for activity 8.3.1.5.2.1.4b.

SCP 8.3.1.5.2.1.1 Regional paleoflood evaluation 0G36221A93

Summary Account Manager - D. Grasso

Technical Activities:

3GQH010A Prepare preliminary summary of YM paleoflood studies

D. Grasso prepared text, draft copies of drainage basin maps, and hydrologic data tables for the preliminary summary report of YM paleoflood studies. These materials describe and show modern-day flood discharge rates and frequencies, annual spring discharge rates, and estimated annual runoff volumes for paleofloods on the Amargosa River. An evaluation of precipitation-runoff volumes for the upper Amargosa River basin above Tecopa will be made using the prepared drainage basin maps. Precipitation-runoff relationships of modern flood events in the watershed are important because of their paleoflood implications for the Yucca Mountain area. To date, numerical estimates of flood discharge rates and frequencies have compared very well with those amounts developed previously for other near-by drainages in the area. Correlations between modern precipitation-runoff and lake level high stands in Death Valley ultimately will be used to estimate a range of potential annual runoff volumes for the upper Amargosa River area during the late Holocene, about 2,000 to 5,000 years ago.

SCP 8.3.1.5.2.1.3 Evaluation of past discharge areas 0G36221C93

Summary Account Manager - E. Gutentag

Technical Activities:

3GQH003 Vegetation mapping phase II

K. Turner continued to fine tune the various vegetation classes using statistical methods. The report on the Amargosa Desert should be completed by July 30.

A field trip was conducted by E. Gutentag, C. Faunt, and F. D'Agnese in early June to Tolicha Peak Bombing Range and the Tonopah Bombing Range to check vegetation.

F. D'Agnese is converting field checked data for the regional vegetation map into a digital format. The data provided by R. Webb for the NTS also was converted from McIntosh ASCII to PC ASCII for use in finalizing vegetation classes. The report on regional vegetation mapping is progressing.

3GQH021 Collect/prepare/analyze faunal/water/soil outcrop

In early June, samples from six playas were collected for SR^{86/87} ratios, soil chemistry, and presence of ostracodes. These sites were: Stonewall Flats-west Playa, Antelope Lake, Playa at Gold Flat, Kawich Playa, Tikaboo Playa, and Browns Lake. The playas were sampled in the lowest point and halfway to an edge.

Three springs were sampled for full chemistries, SR^{86/87} ratios, and for ostracode analyses. The springs sampled were Monte Cristo Spring, Cliff Spring, and Summer Springs. These were all developed springs and the water is used for wild horses. In the Last Chance Range, two spring fed streams were sampled for full chemistries. One, Alum Creek, issues from a sulfide ore altered area and the pH was 3.90. Alum Creek is a tributary of Cottonwood Creek. Cottonwood Creek is spring fed and issues from an albite granite and has a Ph of 8.2. Downstream from the confluence of Alum Creek with Cottonwood Creek is Cottonwood Creek well (27 ft deep), which also was sampled for full chemistry. The Cottonwood Creek well had a Ph of 7.19 indicating a mixing of water in the creek. Samples of both Alum Creek sulfide altered bedrock and granite from Cottonwood Creek also were collected. Ralston Well, near Goldfield, the unused windmill at Bonnie Claire Airport, and the pumping Roosevelt windmill were sampled for full chemistries and SR^{86/87} ratios.

At 10 sites where complete water analyses were available in the QW files, samples were collected to analyze for SR^{86/87} ratios. These sites were: Cactus Spring (Tonopah Test Range), the broken windmill SW of Tolicha Peak, Corral Springs, Reeds Ranch, Stinking Spring, Tolicha Peak O&M facility, the windmill west of Tolicha Peak Electronic Bombing Range gate, Well B-1 (Tonopah Test Range), Rose's Well first overflow, and Rose's Well second overflow.

3GQH025 Analyze water and lithologic samples NWQL/GSP/GD

NWQL has completed all analyses for the water samples submitted in May. NWQL has completed nutrient analysis for the early June trip. GSP has completed the SR^{86/87} analyses.

GSP has not completed the samples because of continued XRF arcing problems.

Playa samples collected from the spring trips will be submitted in early July.

Z. Peterman participated in an informal discussion with B. Moore of Geotrans, Inc. concerning the possibility of improving communications and data exchange between the Yucca Mountain and environmental restoration sides of the NTS.

S Mahan completed 25 Sr isotopic analyses of waters collected from the Grapevine Mountains, Goldfield, Lida Valley and Slate Ridge areas by E. Gutentag, C. Faunt, and F. D'Agnese.

These, along with previously collected, data indicate enrichments in radiogenic Sr (i.e., increasing $^{87}\text{Sr}/^{86}\text{Sr}$ ratios) in ground water along southeasterly flow paths. Waters from these springs and wells have Sr concentrations and isotopic compositions consistent with the regional aquifer system and are distinct from springs discharging from perched aquifers (e.g. Brier Spring, west side Grapevine mountains). These data will be incorporated into the regional ground-water flow model.

Z. Peterman, J. Paces, and J. Evernden, spent four days examining pedogenic and spring discharge deposits at Yucca Mountain and vicinity. Several sites, including Nevares Spring, Ash Meadows, and Ute Crossing, were selected to represent deposits whose ground-water discharge origins are well-established, so that their physical, morphological and geochemical features can be compared with deposits of a more equivocal nature (e.g., deposits currently mapped as Pavit Springs in Rock Valley and elsewhere). Seven rock and water samples were collected and entered into the HD sample tracking system. D. Craft completed physical preparation of these samples for further Sr and U isotopic analysis.

J. Paces met with T. Stafford at the University of Colorado, Boulder, to discuss ^{14}C dating of rhizoliths from the Crater Flat deposit. Dating of these samples, by an independent technique, is critical to establishing the reliability of the relatively young U-series ages of 19 Ka currently available. It was agreed that the samples have the potential to yield reliable organic carbon dates, and several approaches for obtaining a clean organic carbon age were discussed. The current status of Stafford's QA program also was discussed.

Z. Peterman, B. Marshall, K. Ludwig and J. Paces participated in a meeting with B. Steinkampf and M. Ebbinger (LANL) to discuss the IGSG analytical program with regard to water chemistry and modeling in the Yucca Mountain vicinity.

Z. Peterman, S. Mahan, D. Craft, and B. Bole determined geographical coordinates for samples within the IGSG data base and verified locations by replotting on USGS base maps. B. Marshall upgraded the IGSG data base to allow conversion of different geographic coordinate systems, and prepared a short presentation on the different systems used on the project (Lat/Long; Universal Transverse Mercator; Nevada State).

D. Craft and B. Bole serviced and tested a portable, hand-held rock drill capable of obtaining core to depths of approximately 3 m. This drill will be transported to Mercury on the next shuttle, and will be used in the future to obtain core samples from some of the tuffas in the Yucca Mountain vicinity where present exposure does not allow a detailed vertical sampling.

3GQH037 Determine discharge mechanism in hydrologic units

F. D'Agnesse continued to utilize regional spring discharge collected by the past discharge project to regional flow. The grid and map produced by this activity will be used with 3-D modeling.

Work Performed but not in Direct Support of the Scheduled Tasks:

K. Turner and E. Gutentag spent 30 hours preparing sole source justification for ongoing programs. Turner and Gutentag spent 40 hours preparing employee work plans and personnel evaluations. C. Faunt spent approximately 15 hours reviewing a report on hydrochemistry by J. Evernden.

SCP 8.3.1.5.2.1.4a Analog recharge sites 0G36221D93

Summary Account Manager - R. Lichy

Technical Activities:

3GQH20CA Synthesize results of chloride and PRMS models

B. Lichty initiated the synthesis of model results by comparing computed estimates of effective moisture derived by application of the chloride ion balance method with their counterpart from application of PRMS in Kawich watershed. This activity, however, was interrupted and delayed by the need to revise and revamp a technical bulletin article from the Central Region Research side of Lichty's commitment. The synthesis of the model results will resume in July.

SCP 8.3.1.5.2.1.4b Geochemistry of arid-zone infiltration 0G36221E93

Summary Account Manager - A. Riggs

Technical Activities:

3GQH003D Collect watershed inputs and meteorological data

The long-term meteorological data collection continued uninterrupted through June. H. Claassen and D. Halm wrote a program for Campbell data loggers that allow it to collect rainfall intensity data from tipping bucket rain gages. Calibration of the soil moisture probes at Colorado State University continued. A. Riggs and D. Stannard proofread the galleys of the manuscript (by Claassen and Riggs) on the roughness length and displacement height of Sonoran Desert vegetation.

3GQH005D Conduct miscellaneous site characterization activities

H. Claassen and A. Riggs met with B. LaPedus and D. Hughes of the National Mapping Division to get some background on the important points to specify when contracting for a topographic map. Claassen and Riggs wrote a statement of work for having a topographic map of the study area at Organ Pipe Cactus National Monument and initiated the purchase process to point of award.

Quality Assurance:

3GQH003D Collect watershed inputs and meteorological data

A. Riggs read AP-8.1 and the updates to AP-5.1Q.

Planning and Operations:

3GQH007D Analyze/interpret CL-36 and precipitation data

The New Mexico Institute of Mining and Technology contract was extended a year at no increase in funds to allow the modeling work to take place on a schedule consistent with the data input from field work.

Work Performed but not in Direct Support of the Scheduled Tasks:

Staff attended the presentation on dating of the groundwater deposits at the southern end of Crater Flat; participated with D. Appel in the search for new lab/shop space for the project; and began cleaning up new lab/shop space in Bldg. 25. (14 hours)

SCP 8.3.1.5.2.1.5 Studies of calcite and opaline silica vein deposits 0G36221F93

Summary Account Manager - J. Whelan

Technical Activities:

3GQH833A Prepare isotope composition/fluid inclusion history

K. Futa received initial results for ^{90}Sr determinations on soils from Yucca Mountain analyzed by European Analytical Services. Preliminary data indicate weak ^{90}Sr activity (0.018-0.024 pCi/g = $1.3-1.8 \times 10^{-16}$ g $^{90}\text{Sr}/\text{g}$) in four of thirteen samples analyzed. Data are currently being evaluated in terms of analytical detection limits, world-wide post-WWII background levels in soils, and with respect to the stratigraphic relationships between radiogenic and non-radiogenic samples. The four samples that contained weak ^{90}Sr activity were collected from the uppermost

soil horizons at each sample site. Preliminary interpretation suggests that fast infiltration paths of surface waters into soil profiles and fracture fillings were not sampled, and that significant remobilization of carbonate within the pedogenic environment may not have occurred in the past 50 years.

Z. Peterman, B. Marshall, K. Futa, S. Mahan, B. Widmann and J. Paces participated in viewing and discussing a video presented by G. Fraizer at the Spring meeting of the AGU. The video attempts to address evidence for a ground water discharge origin of pedogenic carbonates at Yucca Mountain.

3GQH816B Collect specimens from cores and field sites

T. McConnaughey and J. Whelan spent 4 days at and around the NTS, measuring concentrations of soil gas CO₂ and collecting soil profiles and soil gas profiles for the measurement of the stable isotopic compositions of H₂O and CO₂. Permanent soil, gas sampling probe, arrays were monitored at Fran Ridge, Forty Mile Wash, Pagany Wash, the southern flank of Rainier Mesa (roadcut on Holmes Road), and at the US Ecology low-level waste disposal site near Beatty. Approximately 135 samples of soil, soil gases, and soil carbonate were collected.

J. Whelan and T. McConnaughey spent two days searching for and collecting samples of vein travertine from Grapevine and Nevares Springs (although none were found at Nevares). Excellent samples were obtained from Grapevine of the youngest material from four veins for stable isotope study and reconstruction of paleo climate and hydrology. Samples of the youngest material will be submitted for U-series dating to determine whether these veins were formed in the recent past. Samples were also collected from a small spring mound, just north of Highway 95 in Rock Valley.

R. Moscati entered 6 samples from Rainier Mesa into the sample tracking system.

3GQH832A Prepare mineralogic/petrologic description of specimens

J. Whelan described the petrology, and sampled 22 specimens from drill core UE-25 A-7 and the Bullfrog Gold Mine.

R. Moscati described the petrology, and sampled seven specimens from drill core UE-25 UZ#16.

3GQH833B Prepare isotope composition/fluid inclusion history

T. McConnaughey extracted CO₂ from ~50 soil gas samples for mass spectrometer analysis.

J. Whelan spent a day determining the correct mass spectrometer parameters for automated analysis of the soil gas CO₂ extractions.

R. Moscati prepared new batches of reference CO₂ for the Finnigan 252.

R. Moscati determined the d¹³C and d¹⁸O values of 163 carbonate extractions, mostly from drill core but included 29 standards.

Variations:

The Kiel Automated Carbonate Extraction contraption still has not produced reliable data.

Work Performed but not in Direct Support of the Scheduled Tasks:

J. Whelan prepared a draft of a technical procedure, "*Sampling of precipitation waters from rain gauges*

for stable isotope analysis", which was submitted for review, and redrafted a figure for J. Stuckless for the Trench 14 closure report for DOE.

T. McConnaughey submitted GCP-33, "Extraction of soil gas CO₂ for stable isotope analysis" and GCP-34, "Coulometric analysis of the inorganic and organic carbon content of soils and tuffs" for review.

J. Whelan began recruiting presentations for a Paleoclimate session for next year's ANS Conference.

WBS 1.2.3.7.2.1 Natural Resource Assessment

Principal Investigator - C. Hunter

SCP 8.3.1.9.2.1.1 Geochemistry assess of Yucca Mountain 0G3721A93

Summary Account Manager - Z. Peterman

Technical Activities:

3GNR003B Compile radiometric data, known mineral occurrences

Z. Peterman attended a Geophysics Technical Exchange meeting in Las Vegas.

B. Widmann produced a contoured base map of the Bare Mountain area by digitizing a portion of the Beatty 1:100,000 sheet. This digitized map will be used as a base for computer-plotting sample locations and geochemical parameters and will allow ready spatial visualization of alteration patterns in the Paleozoic carbonate section. In addition, all current sample locations were determined, verified, and plotted on the base map.

B. Widmann compiled a list of all marine carbonate rock units appearing in the IGSG Sr data base, as well as the values for the accepted age of each unit, and the marine ⁸⁷Sr/⁸⁶Sr ratio during that period (Sr isotopic data from Burke et al., 1982). These data will represent the initial unaltered marine Sr isotopic composition of each carbonate unit, and will be used as standard values for comparison of present-day measured ⁸⁷Sr/⁸⁶Sr ratios.

SCP 8.3.1.9.2.1.4 Assessment of hydrocarbon resources 0G3721D93

Summary Account Manager - Z. Peterman

Technical Activities:

3GNR002A Evaluate hydrocarbons in Railroad Valley analog

J. Grow spent most of June on a surface mapping project in the Pancake Range on the west side of Railroad Valley. The northern end of the Pancake Range includes an east-verging overturned syncline involving Late Paleozoic sedimentary strata which is part of the Central Nevada Thrust Belt (CNTB). The implications of the Pancake Range mapping are that there are significant differences in the timing and character of the deformation between the CNTB and the Utah and Wyoming thrust belt. Proposed similarities in oil potential are extremely speculative, especially if extended southward to Yucca Mountain.

1.2.5 REGULATORY AND INSTITUTIONAL

WBS 1.2.5.2.2 Site Characterization Program

Principal Investigator - W. Dudley, Jr.

Prepared input for a response to the State of Nevada and NRC request for baseline surface based data prior to underground mining. Also, prepared plans and budgets required to conduct these tests for the next several years.

G. Bodvarsson worked with D. Langmuir and other members of the NWTRB to finalize the agenda for the full board meeting on thermal loading, to be held on July 13 and 14, in Denver.

G. Bodvarsson prepared materials on geothermal analogs for a scoping meeting for the NWTRB meeting.

J. Czarnecki, F. D'Agnesse, C. Faunt, and K. Turner responded to comments from the NRC on study plan 8.3.1.2.1.4, "Regional ground-water flow system synthesis and modeling".

NRC Interactions (NRC, NWTRB, ACNW)

D. Ambos explained the meteorological studies to a group of climatologists working under the auspices of the NRC. These scientists will independently review results obtained as part of the site characterization studies in terms of climatological modeling. They were interested in obtaining our meteorological data at some point. The group toured the HRF on June 29th. P. Justus (NRC), sponsored the tour.

WBS 1.2.5.3.5 Technical Data Base Input

Principal Investigator - L. Hayes

Standard Data Base Maintenance

Routine jobs were performed throughout the month, including the retrieval of the water quality data from the WRD National Water Quality Laboratory (NWQL), entering the data into the Water Quality (QW) subsystem of the WRD/HIP National Water Information System (NWIS) data base. The maintenance and cleanup of the Satellite Transmission (SATIN) and Automated Data Processing System (ADAPS) logs and directories were accomplished on schedule. Both ADAPS and SATIN are also subsystems within the HIP NWIS data base. A backup of all the NWIS data base subsystem files was performed and the backup tape was sent to the Local Records Center for storage in their fire proof vault.

Due to a shortage of space on the PRIME disks, there were problems with the NWIS data base this month. Necessary utilities were used to maintain the MIDAS and related files within the data base, and no data was lost. Current space utilization is being reviewed and extra archiving procedures are being designed to improve the situation.

Satellite Transmissions

Several small problems were being noticed in the satellite transmissions and storage of ADAPS data in the last month, comparing the older dump tapes from the DCP to incoming messages. After tracing archive, log and message files, the problems appeared to have multiple sources. A meeting was held with the saturated zone water level personnel. D. Burkhardt presented the various sources of the problems to the group and suggested possible options. To alleviate one of the sources, the group decided to rely on the Local Readout Ground Station (LRGS) data only, as it appeared the most reliable data source at this time. Burkhardt is now coordinating this move to the LRGS.

Software Quality Assurance

B. Kerans attended the Software Configuration Committee meeting as the HIP representative.

User Assistance

The DMU staff worked with B. Sockriter of the computer operations unit to put together an "information paper" on possible printer purchasing in response to an inquiry by P. McKinley.

B. Oatfield worked with several HIP staff members at various times throughout the month, assisting them in the use of the NWIS data base (retrievals and available options), other software packages (Surface III), and land-net conventions.

D. Burkhardt and B. Kerans assisted the YMPB administrative staff throughout the month on problems they were experiencing with the Administrative Financial Information Management System (AFIMS), the Property data base, the Career Development Plan (CDP), and various software packages such as WordPerfect.

Data Administration

B. Oatfield worked on verifying and entering several sites in the local HIP NWIS data base in order to facilitate entry of some new Water Quality data and allow entry of some older analyses. In the process, Oatfield discovered discrepancies with some of the site IDs held in common with the Nevada District and will work with Nevada to clear up any problems with these site descriptions.

B. Kerans met with B. Cochran of the Colorado District to review some older AEC sites that were found in the Colorado District NWIS data base during a clean-up procedure.

D. Burkhardt designed a UNIX shell program to check for miscellaneous processes running on the workstations that might interfere with primary data base and application processes also running on the workstations.

Training

D. Burkhardt attended the DG System Administrator's training.

B. Kerans attended the Colorado Ingres Users Group seminar.

B. Oatfield completed readings for the USGS Basic Computer Security Awareness training, and the latest modification of AP-5.1Q. Oatfield also attended the YMP seminar on the Crater Flat spring deposits.

Forty-four TDIFs for ongoing activities were received into the participant data archives (PDA) and 66 were quality checked. Development of the data base to track TDIFs through the PDA (Dataman) is progressing on schedule; the reports section was designed and installed.

For backlog publications, 35 new TDIFs were created. Two previously completed backlog TDIFs were corrected to meet current standards.

WBS 1.2.5.4.4 Site Performance Assessment

Principal Investigator - A. Flint

Technical Activities:

3GPA006 Prepare technical report on 1-D and 2-D models

The 1-D model and results were presented at the IHLWC in Las Vegas, NV, March 1993. The paper is entitled "*The influence of long term climate change on net infiltration at Yucca Mountain, Nevada*" by A. Flint, L. Flint and J. Hevesi. The paper is in the proceedings. The

paper presenting the results of the 2-D matrix model is entitled "*Numerical modeling of lateral infiltration into the Paintbrush unit at Yucca Mountain, Nevada*" by M. McGraw, G. Bodvarsson, L. Flint and A. Flint. This paper is currently in review by SNL and USGS and will be published as a SAND report.

3GPA011 Prepare technical report on fracture/fault model
A technical report detailing this work is currently being written.

WBS 1.2.5.4.6 Development and Validation of Flow and Transport Models

Principal Investigator - A. Flint

Technical Activities:

3GVF012 Prepare technical report on functional relations
Moisture retention curves were determined and preliminary functional relationships were developed and tested under activity "Develop and test hydraulic functional relations" (GVF007). Work began on the preparation of a technical report on the analysis of the final functional relations.

WBS 1.2.5.4.7 Supporting Calculations for Postclosure Performance Analyses

Principal Investigator - A. Flint

Technical Activities:

3GPC008 Prepare technical paper on thermal effects
All of the rock property measurements were completed under activity (3GPC007). A technical report on these measurements is being prepared.

1.2.9 PROJECT MANAGEMENT

WBS 1.2.9.2.2 Participant Project Control

Principal Investigator - R. Ritchey

"Soon-To-Come-Due" reports, comparison reports, and bar charts displaying current schedule status against the baseline, were prepared. Variance analyses were prepared.

An analysis of planned vs. promised delivery dates for FY93 milestones was conducted. A report was prepared concerning milestone progress to date and projections for the remainder of the fiscal year.

1.2.11 QUALITY ASSURANCE

WBS 1.2.11.1 Quality Assurance Coordination and Planning

Principal Investigator - T. Chaney

To accommodate the QARD transition, 22 Quality Management Procedures (QMPs) are in the preparation or review process. Steady progress is being made in meeting the USGS commitment for completing the QARD transition.

WBS 1.2.11.2 Quality Assurance Program Development

Principal Investigator - T. Chaney

Input of data, tracking dates of assignment, and other details necessary to keep the open items database current were handled. Daily and weekly Status of Open Items were prepared and input to the Open Items Database for trending. The May Open Items and Trend Analysis Reports were written and issued.

WBS 1.2.11.3.1 Quality Assurance Verification - Audits

Principal Investigator - T. Chaney

Five deficiency documents were verified and closed.

All members of the SAIC Audit Group participated as personnel being audited and auditor escorts during the YMPO Audit of the YMP-USGS. Audited criteria included the Corrective Action System (criteria 16) and Audits and Surveillances (criteria 18). Two Corrective Action Requests were initiated during the audit against QMP-16.01 (ineffective resolution of CARs) and QMP-4.01 (failure to pass down QA requirements to suppliers). As part of the audit, an investigation into supplier QA programs was conducted and documented.

Audits of Branch of Quality Assurance and Intertyme Metrology, Inc., were conducted resulting in recommending their retention on the Approved Suppliers List.

USGS-NCRs -93-32 and -93-44 were initiated because optical level peg tests were not performed as required, and pyranometers were not calibrated as scheduled.

Corrective actions for AFR-USGS-9118-01, -02 and -03 were verified. Actions for AFR-9118-01 was unsatisfactory and it was reissued.

Corrective Action Report CAR-92-03 was verified for work performed without management agreements.

Supplier Audit No. USGS-93-11 of Storage Technology Corp. was performed yielding several concerns including a discrepancy with regard to several calibration certifications. The supplier was given additional opportunity to correct the calibration certifications, and the final results of the audit are pending the corrections.

The closure of the nine deficiency documents was documented.

WBS 1.2.11.3.2 Quality Assurance Verification - Surveillances

Principal Investigator - T. Chaney

Surveillance USGS-93-S04, for the monitoring of YMP-USGS SCP activity 8.3.1.4.2.2.1, Geologic Mapping of Zonal Features in the Paintbrush Tuff, and USGS-93-S06, for SCP activity 8.3.1.4.2.2.4, Geologic mapping of Exploratory Studies Facility (ESF), were conducted with satisfactory results.

WBS 1.2.11.5 Quality Assurance - Quality Engineering

Principal Investigator - L. Hayes

Several meetings were attended to resolve or discuss QARD and QMP requirements concerning defining "scientific and engineering software" (QMP-3.03 R4), resolving reviewer comments about grading requirements (QMP-3.15), and changes to scientific notebooks (QMP-5.05).

Seven backlog publication/data packages were reviewed, authenticated as required by QMP-17.01 and submitted.

The Open Items Committee met during June to discuss the status of corrective actions, the results from the DOE/YMQAD Audit 93-10, and data schedules for submittals, both to Participant Data Archives and to the YMP-USGS Local Records Center.

Approximately 60 software documents have been received, reviewed, and/or processed by the SCM Coordinator in accordance with QMP-3.03, R3.

1.2.12 INFORMATION MANAGEMENT

WBS 1.2.12.2.2 Local Records Center Operation

Principal Investigator - L. Hayes

All records were received into the Local Records Center (LRC) within the 10-day submittal requirement and were transmitted to the Central Records Facility (CRF) within the required time-frame. No corrective actions were requested of the USGS by the CRF, making YMP-USGS accuracy rate 100 percent.

Three hundred sixteen individual records were received into the LRC, along with 124 current criteria packages, 4 data packages, 1 publication, and no cited reference lists. Two percent (2%) of LRC receipts required corrective action by the LRC staff.

Current material transmitted to the CRF from the LRC included 69 individual records and 102 criteria packages (2448 pages) and 10 data packages (9222 pages). Backlog material included 4 publications packages, 14 other criteria packages, and no backlog cited references (packages totaled 1,727 pages).

The records program underwent the DOE audit with no problems identified. The LRC staff was commended by the Lead Auditor for their above average servicing of retrieval needs supporting the DOE audit.

WBS 1.2.12.2.5 Document Control

Principal Investigator - L. Hayes

The Quality Management Procedure Modifications QMP-18.02,R2-M2, Surveillances, and QMP-2.07,R1-M6, YMP-USGS Instruction, were distributed. Five technical procedures were distributed.

1.2.15 SUPPORT SERVICES

WBS 1.2.15.3 Yucca Mountain Site Characterization Project Support for the Training Mission

Principal Investigator - L. Hayes

T&MSS instructors were provided assistance during General Employee Training and Initial Instructor

Training classroom sessions and a YMP-USGS Orientation information packet was developed for issuance as a reading assignment to trainees with a limited amount of time and/or scope of work on the YMP-USGS. Information was provided to C. Rehkop, DOE Training Officer and G. Mansur, T&MSS Training during their visit to assess the effectiveness of the YMP-USGS Training Program.

Four classroom sessions were provided for YMP-USGS trainees. Mass reading assignments were distributed for AP-8.1, Land Access and Environmental Compliance. Five technical procedure reading assignments were distributed.