

*rec'd with letter dated
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United States Geological Survey
YUCCA MOUNTAIN PROJECT
Monthly Highlights and Status Report
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TABLE of CONTENTS

Acronym List	iv
1.2.1 Systems Engineering	1
1.2.3 Site	1
WBS 1.2.3.1 Coordination and Planning	1
WBS 1.2.3.2 Geology	7
WBS 1.2.3.2.2 Rock Characteristics	7
WBS 1.2.3.2.2.1 Geologic Framework of the Yucca Mountain Site	7
WBS 1.2.3.2.2.1.1 Vertical and Lateral Distribution of Stratigraphic Units within the Site Area	7
WBS 1.2.3.2.2.1.2 Structural Features within the Site Area	10
WBS 1.2.3.2.5 Postclosure Tectonics	14
WBS 1.2.3.2.5.3 Changes in Hydrology Due to Tectonic Events	14
WBS 1.2.3.2.5.3.2 Effect of Tectonic Processes and Events on Changes in Water-Table Elevation	14
WBS 1.2.3.2.5.5 Information Required by the Analysis and Assessment Investigations of the Tectonics Program	14
WBS 1.2.3.2.5.5.2 Characterization of Igneous Intrusive Features	15
WBS 1.2.3.2.6 Surface Characteristics	15
WBS 1.2.3.2.6.2 Soil and Rock Properties of Potential Locations of Surface Facilities	16
WBS 1.2.3.2.6.2.2 Surface Facilities Laboratory Tests and Material Property Measurements ...	16
WBS 1.2.3.2.8 Preclosure Tectonics	18
WBS 1.2.3.2.8.3.4 Effects of Local Site Geology on Surface and Subsurface Motions	19
WBS 1.2.3.2.8.4 Preclosure Tectonics Data Collection and Analysis	20
WBS 1.2.3.2.8.4.1 Historical and Current Seismicity	20
WBS 1.2.3.2.8.4.2 Location and Recency of Faulting Near Prospective Surface Facilities	21
WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain	22
WBS 1.2.3.2.8.4.4 Quaternary Faulting within Northeast-Trending Fault Zones	23
WBS 1.2.3.2.8.4.5 Detachment Faults	24
WBS 1.2.3.2.8.4.6 Quaternary Faulting within the Site Area	25
WBS 1.2.3.2.8.4.12 Tectonic Models and Synthesis	28
WBS 1.2.3.3 Hydrology	28
WBS 1.2.3.3.1 Geohydrology	29
WBS 1.2.3.3.1.1 Description of the Regional Hydrologic System	29
WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology	29
WBS 1.2.3.3.1.1.2 Runoff and Streamflow	30
WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling	33
WBS 1.2.3.3.1.2 Unsaturated Zone Hydrology	37
WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration	37
WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study	40
WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study	44
WBS 1.2.3.3.1.2.6 Gaseous-Phase Movement in the Unsaturated Zone	47
WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry	48

TABLE of CONTENTS

WBS 1.2.3.3.1.2.8	Fluid Flow in Unsaturated Zone Fractured Rock	52
WBS 1.2.3.3.1.2.9	Site Unsaturated Zone Modeling and Synthesis	53
WBS 1.2.3.3.1.2.10	Prototype Hydrologic Tests that Support Multiple Site Characterization Activities	55
WBS 1.2.3.3.1.3	Saturated Zone Hydrology	57
WBS 1.2.3.3.1.3.1	Site Saturated Zone Ground-Water Flow System	57
WBS 1.2.3.3.1.3.2	Saturated Zone Hydrochemistry	65
WBS 1.2.3.3.1.3.3	Saturated Zone Hydrologic System Synthesis and Modeling	67
WBS 1.2.3.6	Climatology and Meteorology	69
WBS 1.2.3.6.2	Climatology	69
WBS 1.2.3.6.2.1	Change in Climatic Conditions	69
WBS 1.2.3.6.2.1.1	Modern Regional Climate	69
WBS 1.2.3.6.2.1.2	Paleoclimate Study of Lake, Playa, and Marsh Deposits	70
WBS 1.2.3.6.2.1.3	Climatic Implications of Terrestrial Paleocology	71
WBS 1.2.3.6.2.1.4	Paleoenvironmental History of Yucca Mountain	71
WBS 1.2.3.6.2.2	Effects of Future Climatic Conditions on Hydrologic Characteristics	72
WBS 1.2.3.6.2.2.1	Quaternary Regional Hydrology	72
1.2.5	Regulatory and Institutional	80
WBS 1.2.5.2	Licensing	80
WBS 1.2.5.2.2	Site Characterization Program	80
WBS 1.2.5.3	Technical Data Base Management	81
WBS 1.2.5.3.5	Technical Data Base Input	81
WBS 1.2.5.4	Performance Assessment	82
WBS 1.2.5.4.4	Site Performance Assessment	83
WBS 1.2.5.4.6	Development and Validation of Flow and Transport Models	83
WBS 1.2.5.4.7	Supporting Calculations for Postclosure Performance Analyses	84
1.2.9	Project Management	84
WBS 1.2.9.1	Management and Integration	84
WBS 1.2.9.1.2	Technical Project Office Management	84
WBS 1.2.9.2	Project Control	84
WBS 1.2.11.1	Quality Assurance Coordination and Planning	85
WBS 1.2.11.2	Quality Assurance Program Development	85
1.2.11.3	Quality Assurance Verification	86
WBS 1.2.11.3.1	Quality Assurance Verification - Audits	86
WBS 1.2.11.5	Quality Assurance - Quality Engineering	88
WBS 1.2.12.2.2	Local Records Center Operation	89

TABLE of CONTENTS

WBS 1.2.13.4 Environmental Field Programs 91
 WBS 1.2.13.4.7 Water Resources 91

1.2.15 Support Services 92
 WBS 1.2.15.3 Yucca Mountain Site Characterization Project Support for the Training Mission .. 93

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
BES	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	Bonanza 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/NV O	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
EEI	Edison Electric Institute
EEP	Emergency Evaluation Plan
EFAP	Environmental Field Assessment Plan
EIA	Emergency Information Administration
EIS	Environmental Impact Statement
EKES	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 Study: 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
REEC _o	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
SETP	Surface-Based Test Prioritization
S	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 neutrons
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 diffraction
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

OBJECTIVE

To apply the systems engineering discipline to transform the regulatory requirements into functional needs of the MGDS design, system configuration, and site characterization activities.

WBS No. 1.2.1.6 Configuration Management

OBJECTIVE

To develop and maintain a configuration management system and provide associated support to the CCB.

ACTIVITIES AND ACCOMPLISHMENTS

Development of Configuration Management Guidelines for the YMP-USGS Program began and a flow chart of proposed Configuration Management Plan activities was developed. Six Change Requests/Affected Document Notices were processed in accordance with AP-3.3Q.

1.2.3 SITE

OBJECTIVE

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

WBS 1.2.3.1 Coordination and Planning

Principal Investigator - L. Hayes

OBJECTIVE

To coordinate and plan the work performed within the site WBS elements.

M&I QA Implementation GSP OG3193G2

Summary Account Manager - J. Stuckless

ACTIVITIES AND ACCOMPLISHMENTS

Continued to coordinate orientation, training, document control, and personnel qualifications for new GSP personnel. Overdue DTNs and instruction assignments for the GSP were tracked and followed-up. Numerous TDIFs and data records package segments were prepared for the GSP. Preparation of TDIFs for backlog records and data continued. Guidance and support was provided to the GSP staff for USGS Audit 93-06. Calibration status was tracked.

Test Planning Package and Job Package input and revisions were begun for a shallow seismic refraction survey, Bare Mountain trenching, and the resurvey of the trilateration network. Requests for calibration vendor evaluations were initiated. Meetings were held to prepare for the deep seismic reflection study that should be conducted this spring.

Completed Verification Activity USGS-VA 93-02 for transfer of PI responsibilities in soils and rock investigations from USBR to SNL.

Continued to investigate and monitor the status of controlled property transferred from the Branch of Geologic Risk Assessment to the YMPB. A meeting was held with the University of Nevada, Reno Seismological Laboratory (UNRSL) to develop a plan to come to closure.

Data submittal meetings were held with the UNRSL, in Reno, NV with YMPB staff. Orientation, training, technical procedure preparation, procurement, data submittal, and software QA implementation support were provided to the Menlo Park, CA staff.

The following technical procedures and scientific notebook plans were processed through signature approval and were submitted to Document Control for distribution. Records packages were prepared and submitted.

GCP-30, R0	Carbon dioxide measurement with EGM-1 and WMA-2 portable IRGA
GCP-31T, R0	Collection of neo-formed carbonate from soils
GCP-32T, R0	Collection of soil gases and moisture for stable isotope analysis
GP-50, R0	Photogeologic evaluation of faults using conventional and low-sun-angle vertical aerial photographs
GPP-20, R3	Measurement of subsurface temperature

GP-18, R1, "Petrographic analysis of volcanic rocks", is in QA review. SP-11, R3, "Operation and calibration of remote telemetered seismic array", is in technical review. GCP-29, R0, "Thermoluminescence dating", was prepared per author's instructions and returned for review. GP-43, R0, "Geodetic trilateration and global positioning system (GPS) survey's", and GP-51, R0, "Topographic profiling of geomorphic features - field measurement", are being prepared. Modifications for GCP-21, R1, "Sm-Nd isotope geochemistry", and GP-20, R0, "Volumetric estimation of lithophysae", are being processed.

Four MOAs were approved and distributed per QMP-4.02. The disposition responses for USGS-NCR-93-08 and -93-09 were prepared and submitted to the QA office for approval. Three YMP-USGS ACSRs were prepared and submitted to the GSP representative on the GAC.

Requisition Requests were prepared for various investigators and submitted to the QA Office for QA review. An investigator was assisted with the preparation of documentation for his up-coming trip to the NTS for magnetic borehole logging.

The USGS Technical Data Working Group met to discuss the Quality Assurance requirements and description concerning technical data.

A "Backlog Publication TDIF Guide" is being prepared for use when preparing Technical Data Information Forms (TDIFs) for USGS publications published prior to December 7, 1990.

M&I - Hydrology Program Management and Administration 0G3193H1
Summary Account Manager - D. Gillies

ACTIVITIES AND ACCOMPLISHMENTS

Section II: Narrative of work performed

Status on all 62 USGS and LBL hydrology summary-account schedules, as of the end of February was performed using schedule-status, progress, and variance information provided by each summary-account manager. Two accounts showed relatively small negative schedule variances, neither of which have any significant long-term impact on major milestones, and which probably can be made-up by the end of FY93. Negative schedule variances are approaching 20 K for two other summary accounts. These are being investigated to determine what sort of corrective action might be necessary to avoid significant schedule impacts later in FY93 or in FY94. Nine summary accounts showed cost variances greater than 25 K, most caused by administrative delays in the execution of pending contracts and in the filling of personnel vacancies. The largest cost variance was

+133 K in the LOE account for "Percolation in the UZ. surface-based testing" resulting from three critical vacancies not being filled until the February-March time frame.

D. Gillies attended the USGS QA audit (on SCP Study 8.3.1.2.2.8, "Fluid flow in unsaturated, fractured rock") at LBL.

A meeting of all hydrology-program principal investigators (PIs) was held to exchange technical information regarding UE-25, UZ-16 and other technical topics. The group also discussed field work that needs to be completed in the next few months.

M. Chornack assisted with field data-collection activities for SCP Study 8.3.1.2.2.6 (Unsaturated-zone gaseous-phase movement). Gas chemistry and volume of gas flow out of UZ-6, UZ-6s, and selected neutron holes are being measured while the holes are still in their winter/early spring exhaust cycle.

B. Dudley, Z. Peterman, and D. Luckey, as the Executive Subcommittee of the Committee for the Advancement of Science at Yucca Mountain (CASY) organized a symposium on thermal-loading effects that was held in Denver, March 24-25, 1993. Over 100 people attended the symposium with over one-half being non-USGS technical people working on the Yucca Mountain Project.

Hydrology program management staff prepared presentations for a DOE-YMP total-system-performance-assessment exchange. Hydrology program presentations described current data-collection activities and the out-year framework for producing site-characterization that will be available for performance-assessment analyses. USGS PIs met with the YMP performance-assessment group. Information was exchanged on what performance assessment needed from site characterization and what geologic and hydrologic information the USGS had generated that would be of use to performance assessment. USGS and visiting YMP performance-assessment staff attended the USGS Mendenhall Lecture by Isaac J. Winograd titled "The roles of intuition, luck, and non-canceling unknowns in an exciting discovery--the Devil's Hole paleoclimate record".

M&I QA Implementation. Hydrology 0G3193H2
Summary Account Manager - W. Causseaux

ACTIVITIES AND ACCOMPLISHMENTS

Technical Procedures

S. Frans is currently processing 44 Hydrologic Procedures and Scientific Notebook Plans.

M. Ciesnik closed Scientific Notebooks -0014 and -0015 and sent them to the Quality Assurance Office for final review.

The following draft hydrologic procedures, scientific notebook plans, and/or modifications were prepared or changed as requested and returned to HIP.

HP-07, R2	Use of a trace gas for determining atmospheric contamination in a dry-drilled borehole
HP-59, R1	Method for calibrating digital thermometers
HP-160, R2	Methods for analysis of samples for gas composition by gas chromatography
HP-175, R3	Method for surface measurements of velocity, direction, temperature and humidity of convective airflow in topographically-affected wells

HP-176, R2	Procedure to collect gas composition samples at selected depth intervals
HP-177, R2	Operation of a barometric pressure transducer
HP-192, R2	Shallow soil gas collection
HP-229, R2	Determination of water content and physical properties for laboratory rock samples
HP-243, R0	Method for measuring the particle volume and/or particle density of rock or soil samples using the Micromeritics Accupyc 1330 Pycrometer
HP-247, R0	Thermistor calibration procedure for pneumatic testing section of unsaturated zone borehole testing program
HP-251, R0	Calibrations of pressure transducers for pneumatic testing section of unsaturated zone borehole testing program
HP-252, R0	Method for sealing core samples during drilling at unsaturated zone boreholes
HP-260, R0	Sampling hydrologic testing, and monitoring perched water zones in the Exploratory Shaft Facility
HP-261T, R0	Collection and processing of rock cutting samples from wells drilled with mud using the rotary hydraulic method
HP-263, R0	Particle size analysis
HP-264, R0	Field measurement of precipitation using non-recording rain gages

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

HIP Technical Procedures - HP-07, R2, HP-160, R2, HP-192, R2, HP-261T, R0, and HP-260, R0 were approved.

Quality Management Procedures

M. Ciesnik performed a technical review of QMP-3.03, R3, Mod 3.

Open Items

M. Ciesnik initiated NCR-93-12 (No requisition requests).

J. Watson assisted with the preparation and submittal of the initial response to NCR-93-09, which will be a GSP issue henceforth.

USGS-NCR-93-06 was voided.

J. Woolverton provided input to W. Causseaux for the response to USGS-CAR-92-02, R1.

M. Pabst prepared and submitted "Impact on quality" a statement for conclusion of response to CAR-92-03 (MOA between HIP and Branch of Isotope Geology).

Management Agreements

Management Agreements between the HIP and WRD's NRP for Dr. H. Haas and Dr. N. Plummer were approved.

A Management Agreement between HIP and Isotope Geology was approved 03/12/93.

The Task Agreement between the USBR and SCP Activity 8.3.1.2.3.1.3-4 (Umari) has been approved, effective 03/31/93.

Software

Lotus 1-2-3 was released for use by SCP Activity 8.3.1.2.3.1.2 for the calculation of water-level altitudes.

Grading

ACSRs for SCP Activities 8.3.1.2.1.4 and 8.3.1.5.2.2 have been approved (J. Watson).

Sample Management

Sample collection forms referencing a March 7, 1993 field trip for SCP 8.3.1.5.2.1.3 were submitted to the SMF on March 18, 1993.

QA Training

HIP QA staff members attended GERT training on 03/30/93.

Meetings and Travel

J. Woolverton assisted A. Flint's staff in the preparation of technical procedures.

J. Woolverton and D. Gillies participated in Audit No. USGS 93-06 at LBL.

J. Woolverton participated in Surveillance No. USGS-93-s03 at the Nevada Test Site.

M. Pabst attended CCC meetings for support in documenting Activity 8.3.1.2.2.3.2 "Software documentation".

Records Management

Five HIP Technical Procedure packages were submitted to the LRC by S. Frans, and the records package for the approved Task Agreement was sent to the LRC.

S. Frans assisted the UZ QA Section staff by preparing records packages for N. Plummer's and H. Haas's Management Agreements.

M. Pabst prepared and submitted records for HIP - Isotope Geology MOA.

M. Pabst prepared and submitted copies of Scientific Notebook USGS-SN-0003 to the QA Office in compliance with QMP-5.05, I.C.

Computer Operation & Data Management, Hydrology 0G3193H3

Summary Account Manager - C. Washington

ACTIVITIES AND ACCOMPLISHMENTS

I. Novell System

Novell users were experiencing problems with the server. All the cables were changed in building 53 and the Parfet building, in addition to tweaking the Novell server and this minimized the problem. The problem only occurs now because of the communication load put on it.

A HP LaserJet 4 was installed on the LAN in place of the Xerox 4045. The rising cost of maintenance of the Xerox made it impractical to support.

The project management package SYZYG, has been installed on the server, and will be tested the week of April 12, 1993.

A new backup system will be installed on the server during the week of April 12, 1993. This system will be run directly from the server, thus eliminating the traffic across the LAN from a workstation backup system.

II. Unix System

Numerous software packages on the DG server and the Prime were either installed or upgraded in order to implement DIS-II strategy.

Arc 6.1.1, update to Matlab, and a Beta test version of Minitab 9.1 was installed on the SUN server.

Two DG workstations, as well as the 64MB memory upgrade to the DG server were received and installed.

A variety of X-Windows emulators were tested, DesView/X was selected because of the ease of setup and the tolerance for more video cards.

III. YMPB, Las Vegas

The PCs in the YMPB offices were set up with ethernet card and TCP/IP software to enable connection to HIP's LAN. SAIC Las Vegas indicated that the offices will be wired the week of April 5, 1993.

IV. Field Operations Center (FOC)

The wiring of the FOC has been delayed for approximately 3 months.

V. Parfet Bldg

The Parfet building again has contracted a virus. This is the same virus as before, the Stoned Virus. All infected Pcs were cleaned of the virus, all diskettes located were cleaned and software was installed to immunize those Pcs.

VI. Local Records Center (LRC)

The COU and SAIC Las Vegas were able to get remote printing working from the Las Vegas Vaxes to HIP's printers. This will enable the LRC to print from the data bases on the Vaxes directly to HIP's printers.

VII. Miscellaneous

The COU is in the process of preparing the HIP portion of the DOE Short Range Plan for 1994.

Various VGA cards and monitors are being tested to use with X-Windows to allow full screen editing of AIS and NWIS-II applications.

Scientific Reports and Project Documents, Hydrology 0G3193H4

Summary Account Manager - T. Brady

ACTIVITIES AND ACCOMPLISHMENTS

Scientific Reports Processing

J. LaMonaca is currently processing 89 YMP-HIP scientific publications, 66 YMP-GSP scientific publications, 13 YMP-LBL scientific publications, and 38 abstracts.

Tim Brady completed HIP review of the following reports: "Precision and accuracy of

water-level measurements taken in the Yucca Mountain area, Nye County, Nevada", by M. Boucher; "Ground water estimates using a geomorphic-distributed parameter simulation model approach, Amargosa River Basin, Nevada and California", by W. Osterkamp, L. Lane, and C. Savard; "Characterizing the distribution of pedogenic carbonates using a geographic information system and a carbonate accumulation program, Amargosa Desert, Nevada", by C. Faunt, K. Kolm, and E. Gutentag; "Status of aeromagnetic survey coverage of part of southwestern Nevada and southeastern California", by R. Sikora, and H. Oliver; "A reconnaissance study of strike slip faulting near, Yucca Mountain, Nevada", by D. O'Leary; "Effects of wet and dry coring fluids on in-situ hydrologic conditions of unsaturated tuffaceous rock, Nevada Test Site, Nye County, Nevada", by M. Chornack, and A. Flint; and "Pore-water extraction from unsaturated tuff by triaxial and one-dimensional compression methods, Nevada Test Site, Nevada", by T. Mower, J. Higgins, I. Yang, and C. Peters.

HIP review of the following abstracts was completed by Tim Brady: "Multi-mode reverse time USP imaging over complex structure of Yucca Mountain", by H. Jaramillo, A. Balch, E. Cernal, and J. Rousseau; and "Cosmogenic ^{36}Cl dating of piedmont slope at Organ Pipe Cactus National Monument, South-Central Arizona, U.S.A.", by B. Liu, and F. Phillips.

Study Plan Status

Study Plan 8.3.1.2.2.4, R2 "Unsaturated zone-Exploratory Studies Facility"; and Study Plan 8.3.1.2.2.6, R1 - "Gaseous phase movement in the unsaturated zone" were submitted to YMPO for DOE technical review.

WBS 1.2.3.2 Geology Principal Investigator - J. Stuckless

OBJECTIVE

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

WBS 1.2.3.2.2 Rock Characteristics

OBJECTIVE

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

WBS 1.2.3.2.2.1 Geologic Framework of the Yucca Mountain Site

OBJECTIVE

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

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

Principal Investigator - R. Spengler

OBJECTIVE

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

SCP 8.3.1.4.2.1 Vertical & lateral distribution of stratigraphic units LOE Account 0G32211Z93
Summary Account Manager - R. Spengler

ACTIVITIES AND ACCOMPLISHMENTS

Preliminary cross sections were constructed of proposed ramp alignments and underground excavations of the ESF. These sections were delivered to DOE and design groups February 18. Current efforts involve minor corrections and enhancements for distribution through EG&G. Stable-base mylars were produced and will be transferred to EG&G in April, which will allow appropriate distribution to YMP participants. The sections will eventually be released as an Open-File Report.

C. Hunter compiled materials in support of D. Williams' (DOE) upcoming presentation to the NWTRB on integration of surface and subsurface mapping. This support included attendance at a scoping meeting with DOE.

C. Hunter, J. Nelson and R. Dickerson met with representatives of Dynamic Graphics Inc. (D. Clark and D. Smith) to discuss conversion issues related to the Lynx files from our stratigraphic/structural synthesis and the DGI system in place at EG&G. Results of these efforts were presented to L. Hayes with the preliminary conclusion that conversion will be cumbersome at best, and much more complicated than anticipated.

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

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGU11AA Conduct lithologic logging/synthesize borehole data

R. Dickerson and R. Drake completed detailed technical changes on the 1:6000-scale geologic cross sections depicting the north ramp, south ramp, and main Topopah-level drift alignments. D. Buesch expedited some changes in the technical details of the cross sections and the TDIF process to get this data released for YMP distribution. The sections will be published as an Open-File Report.

Three drill holes were completed during March. NRG-6 reached total depth of 1100 ft, NRG-3 reached total depth of 330 ft, and UZ-16 reached 1686 ft. Core from NRG-3 has not been made available for examination. In UZ-16, preliminary lithologic identification indicates tuffaceous rocks of Calico Hills from 1201 ft to 1485 ft, and the Prow Pass Member of the Crater Flat Tuff from 1485 ft to 1686 ft. Down-hole video logs were made of NRG-2 from 174 ft to 215 ft and UZ-16 from 74 ft to 1602 ft, but analysis in the laboratory has not begun. NRG-2 was run under QA procedures and can be used for comparison with core logs. R. Drake assisted D. Buesch in the many hours spent reviewing structure logging techniques. The format of structure logs for all drill holes was finalized. A summary report is in progress and will outline the recommendations for this activity. Management of the structure logging activity for NRG holes will be conducted by SNL under the soil and rock studies.

3GGU21AA Conduct isotopic sampling/ analysis/ evaluation/ synthesis

B. Marshall and S. Mahan corrected a potential problem with the energy-dispersive x-ray fluorescence system caused by large amounts of tungsten in some samples introduced by heavy liquids during mineral separation procedures. Tungsten causes large errors in Rb through Nb analyses, however the problem was discovered and fixed before affecting any

YMP data.

3GGU400 Construct isopach and structural contour maps

J. Nelson and R. Dickerson continued work on volume modeling of the subdivided Topopah Springs Member in the computer-based stratigraphic synthesis. J. Nelson expedited the exchange of information between LYNX Geoscience Modeling System (GMS) representatives and EG&G personnel in their attempts to test whether EG&G software will be able to utilize LYNX output.

Quality Assurance:

Personnel completed all assigned reading requirements and training including GERT.

Quality assurance revision of Technical Procedure GP-20, R0, "Volumetric estimation of lithophysae" is underway.

B. Marshall revised Technical Procedure GCP-25 "Determination of chemical composition by energy dispersive x-ray fluorescence spectrometry" in response to final comments from the QA group.

Planning and Operations:

R. Dickerson and J. Nelson responded to a request by R. Nolting (M&O, ramp design group) for data from the computerized stratigraphic synthesis for projected depths to subdivisions of the Topopah Springs Member in NRG-6 and at the point in the north ramp where the first bend is planned.

D. Buesch was involved in various meetings concerning location of NRG-2a, disposal of soil samples from previous soil and rock study activities, methods of locating the TSw1-2 contact at the entry point (EC-1) to the ESF along the north ramp, and consultation on methods to determine the TSw1-2 contact at EC-1.

SCP 8.3.1.4.2.1.2 Surface-based geophysical surveys 0G32211B93

Summary Account Manager - C. Hunter

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGU265 Analysis of bids for seismic contract

USGS Headquarters audits of seismic reflection proposals are underway, with completion expected in early April. Planning discussions have continued with DOE/M&O staff regarding issues of safety and test interference.

3GGU250A Conduct magnetic/gravity investigation in Yucca Wash

New gravity and ground magnetic data sets obtained in Yucca Wash in September 1992 were reduced to anomalous values. H. Oliver will begin to study their interpretation.

3GGU201A Conduct magnetic/gravity investigations along seismic profile

The planned aeromagnetic flights along, and on either side, of the proposed seismic profile were postponed due to the pilot's illness. Work is expected to begin in May.

Quality Assurance:

D. Plouff completed an 18-page user documentation paper for GVOUTERTC, the computer program that computes outer zone terrain corrections to gravity data.

T. Brocher submitted revisions of Technical Procedure SP-10, R1, "Deep seismic reflection study of the tectonic environment". This procedure is currently in review.

Planning and Operations:

H. Oliver, D. Ponce, and V. Langenheim prepared illustrations for presentations at the American Nuclear Society (ANS) Fourth Annual International High-Level Waste Management Conference.

SCP 8.3.1.4.2.1.3 Borehole geophysical surveys 0G32211C93

Summary Account Manager - P. Nelson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

3GGU371 Run magnetometer/magnetic suscept logs UZ/SD

Calibration of the magnetic susceptibility and magnetometer logging tools was conducted. The logging truck was moved to Las Vegas in preparation for logging of borehole UZ-16. Repair of the Jake brake was required in Las Vegas.

Planning and Operations:

P. Nelson and C. Stoddard took GERT and GET training required by the Nevada Test Site.

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

P. Nelson attended part of the CASY symposium on the extended dry concept. Nelson reviewed a paper on VSP for J. Rousseau.

WBS 1.2.3.2.2.1.2 Structural Features within the Site Area

Principal Investigator - R. Spengler

OBJECTIVE

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

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

Summary Account Manager - R. Spengler

ACTIVITIES AND ACCOMPLISHMENTS

C. Hunter, representing GSP on the GAC, completed review of ACSRs for two studies and related activity in support of the Tectonics program.

C. Hunter compiled materials for D. Williams (DOE) in support of an upcoming NWTRB presentation on integration of Surface and Subsurface mapping.

C. Hunter represented GSP in an information exchange with Performance Assessment modelers (from DOE, SNL, and contractors).

R. Spengler directed compilation of microstratigraphic discriminators in the rocks of the Tiva Canyon Member. Macroscopic features characterizing subunits will be tested with microscopic and geochemical methods.

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

Summary Account Manager - C. Hunter

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGF183A Conduct structural analysis/mapping-exposed fault zones

L. Martin, R. Linden, R. Blackburn, and C.A. Braun continued mapping fractures in Split Wash and work on the detailed stratigraphy in preparation for a tour. Snow covered the outcrops and the majority of the north-facing slopes in early March, making both mapping and stratigraphic work difficult. Both crews collected samples on southern Antler Ridge; fractures were mapped in five areas.

A set of characteristic samples was taken to aid in field examinations. A binocular microscope was used to help confirm field observations. An additional set of samples was taken from the south side of Antler Ridge for chemical analysis and for petrographic work to clarify relationships within the Tiva Canyon Member. Those results are pending.

A. Boulton assisted the Isotope Lab in processing samples from the Ghost Dance Fault and from Bare Mountain for chemical analysis.

3GGF186A Conduct geologic mapping northeast corner of site area

R. Dickerson completed an outline and numerous maps, cross sections, and illustrations for a summary report and presentation at the 1993 Geological Society of America Cordilleran and Rocky Mountain section meeting in Reno, Nevada. Dickerson continued development of a rough draft of an interim report on the mapping of the northeast part of the site area above Yucca Wash.

Reconnaissance mapping in the rocks of Calico Hills along the north flank of Yucca Mountain showed variations in the stratigraphic section that will be compared with sections exposed in upper Paintbrush Canyon and Fortymile Wash.

3GGF200A Conduct mapping of western YM/northern Crater Flats

C. Fridrich completed mapping of the East of Beatty Mountain 7.5 Quadrangle, assisted in the field by M. Murray. This work also supports SCP 8.3.1.17.4.5, Detachment Faults.

3GGF201A Conduct sampling/evaluation isotopic/geochem phase 1 & 2

B. Widmann and A. Walker, along with A. Boulton, prepared 40 samples (submitted by R. Spengler) of a stratigraphic sequence of Tiva Canyon tuffs from Antler Ridge where intense mapping efforts are underway to delineate offsets associated with the Ghost Dance fault zone. Widmann completed XRF geochemical analysis (K, Ca, Ti, Rb, Sr, Y, Zr, Nb, Ba, La, and Ce) of these samples, and (with Walker) organized the resulting data in spreadsheet form. Z. Peterman interpreted the resulting geochemical data into a working chemical-stratigraphic model of potential use in confirming detailed mapping efforts. The systematic variation in these elements clearly provides independent evidence corroborating the subtle physical and mineralogical features presently being used to map fault-related offsets of lithostratigraphic subunits. A first-order geochemical break, analogous to that observed in the Topopah Spring Member, occurs between the high-silica rhyolite and the quartz latite caprock. This feature, which can be resolved within approximately one meter, will be of primary significance as a geochemical marker in future studies requiring independent evidence of stratigraphic position.

B. Widmann provided training to A. Boulton in sample preparation and tracking procedures.

Quality Assurance:

The technical procedure GP-18, Petrographic Analysis of Volcanic Rocks, received technical review; the revision process continued.

Planning and Operations:

C. Fridrich worked on completing preparations for the field mapping in Crater Flat. Preparations included hiring a field assistant; ordering field equipment, base maps, and airphotos; and arranging for transportation and lodging in Beatty.

C.A. Braun, L. Martin, R. Spengler, C. Hunter, Z. Peterman, D. Ross-Brown, and D. Porter participated in discussion, preparation, and review of characteristic distinctions to be used in interpretation of field microstratigraphy in Ghost Dance Fault studies.

C. Hunter and R. Craig met with D. Williams and M. Tynan, of DOE to discuss on-going Ghost Dance efforts and design of possible road cuts along the trace of the fault.

USGS submitted a TDIF for the "Subsurface geology along excavation alignments of the planned exploratory studies facility, cross sections, Yucca Mountain, Nevada".

Buesch attended meetings regarding the prospects of additional drilling along the TS Main Drift and concerning the activities relating to the ESF starter tunnel and the access of PIs to the ESF facilities.

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

D. Buesch field-checked methodologies and reviewed progress on ESF North Portal mapping with Steve Beason.

SCP 8.3.1.4.2.2.2 Surface-fracture network studies 0G32212B93

Summary Account Manager - M. Fahy

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGF100 Compile map of Tiva Canyon data area

M. Fahy continued to work on the report and drawings for the Tiva Canyon data submittal. A Memorandum Of Change was submitted on March 8, 1993 detailing the delays anticipated, due to the involvement of personnel on the underground mapping project and mapping of the ESF North Ramp Portal.

3GGF081 Map and analyze Fern Ridge ESF pits area

As in February, Fahy mapped an additional cell at P2001 while waiting for the construction crews to prepare the North Ramp Portal area. Comparison of February and March graphics (submitted to R. Spengler) presents incremental progress. Two possible "shears" can be interpreted by general fabric orientation and character. These trend in a NW direction. The northernmost shear is southwest of the North testpit; the other is immediately north of the South testpit.

Quality Assurance:

The process to qualify DIPS software continued. The Software Configuration Committee requires additional information regarding the testing of the software. Fahy will submit an addendum to the Software Verification Report the first week of April.

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

Staff worked in support of the underground mapping project and mapping at the North Ramp Portal.

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

Summary Account Manager - S. Beason

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGF006B Map portal/interpret/submit data

M. Fahy, P. Burger, and S. Beason completed geologic mapping of the North Ramp Portal for the ESF. Plan-view mapping of the exposed geology in the area and six traceline surveys were completed. Additional samples were taken of fracture fillings and submitted to the Sample Management Facility. Mapping of the portal area revealed the presence of a previously unmapped north-trending fault east of the portal face. The fault appears nearly vertical and with throw down to the east.

Quality Assurance:

R. Spengler and D. Buesch made brief inspections of the field data collected from the plan-view mapping in conformance with USGS QMP 5.01, R4.

S. Beason met with C. Hunter, A. Whiteside, P. Reilly, G. Brown, and other QA staff for a readiness review regarding upcoming field work.

Planning and Operations:

S. Beason met with Project personnel to discuss plans for the upcoming Starter Tunnel excavation. Plans call for three-shift-per-day excavation and shotcreting each round. This will have significant impact on the underground mapping; round-the-clock mapping crews will be required during round-by-round application of shotcrete.

S. Beason and R. Lung met with S. Levy, D. Vaniman, A. Mitchell, D. Boak (all with LANL) and C. Lewis of the SMF regarding LANL's requirements for consolidated sampling in the starter tunnel. Staff in the LANL test coordinator's office will compile the sampling requirements for the different excavations of the starter tunnel.

Work continued on the criteria letter for the underground mapping of the North Ramp launch chamber.

Work Performed but not in Direct Support of Scheduled Tasks:

M. Fahy and S. Beason prepared a "white paper" comparing the geology of the NRG-1 drill hole and pavement with the geology encountered in the portal excavation for the North Ramp. Portal geology is consistent with expectations drawn from NRG-1 efforts.

SCP 8.3.1.4.2.2.5L Seismic tomography/vertical seismic profiling 0B32212E93

Summary Account Manager - E. Majer

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGF041 Incorporate/integrate VSP model with Rock Characteristics

An interim report, entitled "Integration/interface of seismic imaging with other activities" by E. Majer and T. Daley, was completed and submitted to USGS.

3GGF045 Develop and validate interpretational code
3GGF040 Acquire and analyze VSP data

These tasks were supported with continued preparation for field work. The data acquisition software was modified to incorporate multi-offset, multi-level recording. The VSP system was consolidated and transferred to the LBL logging truck from a "doghouse" configuration. This was possible due to the replacement of an older computer system by a PC-based system that incorporates stacking and correlation functions into a physically smaller package.

WBS 1.2.3.2.5 Postclosure Tectonics

OBJECTIVE

To supply data on the probability and effects of tectonic initiating events that may alter existing conditions at Yucca Mountain and adversely affect repository performance. (SCP Section 8.3.1.8)

WBS 1.2.3.2.5.3 Changes in Hydrology Due to Tectonic Events

OBJECTIVE

To assess or analyze the possibility that tectonic events could cause changes in existing hydrologic conditions at the Yucca Mountain site. (SCP Investigation 8.3.1.8.3)

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

Principal Investigator - J. Whitney

OBJECTIVE

To analyze and assess the probability that tectonic initiating events could result in significant changes in the elevation of the water table or potentiometric surface, changes in the hydraulic gradient, the creation of discharge points in the controlled area, or the creation of perched aquifers in the controlled area. (SCP Study 8.3.1.8.3.2)

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

Summary Account Manager - C. Fridrich

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTW010 Prepare interim report

Work on the interim report began early so that the principal investigator could leave for the field to work on another study.

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

Study Plan 8.3.1.17.4.12 Tectonic Models and Synthesis was reviewed. Approximately 8 hours.

WBS 1.2.3.2.5.5 Information Required by the Analysis and Assessment Investigations of the Tectonics Program

OBJECTIVE

To collect field data called for by analysis and assessment activities in other tectonics investigations to support analyses of volcanic, igneous intrusion, and folding processes. (SCP Investigation 8.3.1.8.5)

WBS 1.2.3.2.5.5.2 Characterization of Igneous Intrusive Features

Principal Investigator - J. Sass

OBJECTIVE

To gather data concerning the presence of thermal anomalies in the area and data on the geochemical and physical effects of intrusions on the surrounding rock. (SCP Study 8.3.1.8.5.2)

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 OG32552C93

Summary Account Manager - J. Sass

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GAT013 Continue field measurements

No field measurements were carried out. No new holes have been made available and none of the WT holes have been reconfigured. There are also some software QA issues outstanding that preclude obtaining qualified data (see discussion of GPP-20 R3 under 3GAT016).

3GAT016 Maintain laboratory /Calibrate equipment

Continued tests of high-temperature thermal conductivity apparatus. The issue of shielding the apparatus against high-pressure failure of the pressure vessel is being researched.

3GAT045 Evaluate drilling plans and recommendations

No activity has been going on with regard to drilling plans. USGS participation in such activities will be initiated by YMP management.

Quality Assurance:

3GAT013 Continue field measurements

A proposal was developed for fast-track resolution of outstanding Software QA issues.

3GAT016 Maintain laboratory /Calibrate equipment

Major comments yet to be resolved regarding QA review of revised GPP-20, R3 center around documentation of software involved in calibration of temperature sondes and calculation of temperatures during logging runs. A software control form for program LSQABC.BAS has been assigned CID #GSP0018. A proposal has been made through the Chief, YMPB to adopt a "task force" approach to completing QA on project software. Continued dialogue with QA specialists on calibration vendors and on calibration of balances, micrometers and vernier calipers.

Variations:

3GAT012 Collect core samples/prepare thermal conductivity specimens

This activity is tied to 3GAT013 for which there has been no opportunity to do field work to collect samples. Efforts are underway to rectify this situation.

WBS 1.2.3.2.6 Surface Characteristics

OBJECTIVE

To collect information on surface characteristics to determine location and design of repository surface facilities. (SCP Section 8.3.1.14)

WBS 1.2.3.2.6.2 Soil and Rock Properties of Potential Locations of Surface Facilities

OBJECTIVE

To characterize the soil and rock at and near the surface to provide design issues with the necessary geotechnical information to help locate the surface facilities, conduct foundation design analyses, evaluate soil-structure interactions, and evaluate potentially unstable slopes; and provide design issues with hydraulic-related soil information for evaluating erosion potential and infiltration-runoff characteristics. (SCP Investigation 8.3.1.14.2)

WBS 1.2.3.2.6.2.1 Surface Facilities Exploration Program

Principal Investigator - M. McKeown

OBJECTIVE

To conduct an exploration program for characterization of the soil and rock conditions that will influence or be influenced by the construction of the surface facilities. (SCP Study 8.3.1.14.2.1)

SCP 8.3.1.14.2.1 Surface facilities exploration program 0G32621A93

Summary Account Manager - M. McKeown

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSR005 Conduct field exploration, mapping, drilling, excavation - north ramp
Analysis of samples is underway under supervision of SNL.

Quality Assurance:

Work continued on compilation of all acquired and developed data for Technical Data Information Form (TDIF) requirements as part of the transition of the soil and rock work to USGS and then to SNL.

Remaining details of the YMP-USGS-QMP-3.10, R2 Verification Activity, USGS-VA-93-02, are nearing completion.

Planning and Operations:

YMPO redefined responsibilities of WBS 1.2.3.2.6 (Surface Characteristics) in March 1993 with specific emphasis on soil and rock investigations (WBS 1.2.3.2.6.2) for potential surface facilities (SCP Studies 8.3.1.14.2.1, Exploration program for soil and rock conditions; 8.3.1.14.2.2, Laboratory tests and material property measurements; and 8.3.1.14.2.3, Field tests and characterization measurements). These studies will be transferred to SNL through a transition utilizing support from USGS staff. Change Control Board change requests are in preparation for necessary revisions to funding accounts, schedules, and other documents.

WBS 1.2.3.2.6.2.2 Surface Facilities Laboratory Tests and Material Property Measurements

Principal Investigator - M. McKeown

OBJECTIVE

To conduct laboratory tests and material property measurements on representative samples of soil and rock. (SCP Study 8.3.1.14.2.2)

SCP 8.3.1.14.2.2 Laboratory test and material property measurements 0G32622A93

Summary Account Manager - M. McKeown

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSR001 Perform materials testing soil & rock phys/mech-north ramp

Sample requests for mechanical testing of samples from depths of 330 ft to 550 ft in NRG-6 were submitted to the SOC. Responsibility for this work has been transferred to SNL.

Quality Assurance:

Work continued on compilation of all acquired and developed data for TDIF requirements as part of the transition of the soil and rock work to USGS and then to SNL.

Remaining details of the YMP-USGS-QMP-3.10, R2 Verification Activity, USGS-VA-93-02, are nearing completion.

Planning and Operations:

YMPO redefined responsibilities of WBS 1.2.3.2.6 "Surface characteristics" in March 1993 with specific emphasis on soil and rock investigations (WBS 1.2.3.2.6.2) for potential surface facilities (SCP Studies 8.3.1.14.2.1, "Exploration program for soil and rock conditions"; 8.3.1.14.2.2, "Laboratory tests and material property measurements"; and 8.3.1.14.2.3, "Field tests and characterization measurements"). These studies will be transferred to SNL through a transition utilizing support from USGS staff. Change Control Board (CCB) change requests are in preparation for necessary revisions to funding accounts, schedules, and other documents.

WBS 1.2.3.2.6.2.3

Principal Investigator - M. McKeown

OBJECTIVE

To determine the dynamic properties of the subsurface soil and rock strata. (SCP Study 8.3.1.14.2.3)

SCP 8.3.1.14.2.3 Surface Facilities field tests 0G32623A93

Summary Account Manager - C. Hunter

ACTIVITIES AND ACCOMPLISHMENTS

Quality Assurance:

Work continued on compilation of all acquired and developed data for TDIF requirements as part of the transition of the soil and rock work to USGS and then to SNL.

Remaining details of the YMP-USGS-QMP-3.10, R2 Verification Activity, USGS-VA-93-02, are nearing completion.

Planning and Operations:

YMPO redefined responsibilities of WBS 1.2.3.2.6 "Surface Characteristics" in March 1993 with specific emphasis on soil and rock investigations (WBS 1.2.3.2.6.2) for potential surface facilities (SCP Studies 8.3.1.14.2.1, "Exploration program for soil and rock conditions"; 8.3.1.14.2.2, "Laboratory tests and material property measurements"; and 8.3.1.14.2.3, "Field tests and characterization measurements"). These studies will be transferred to SNL through a transition utilizing support from USGS staff. CCB change requests are in preparation for necessary revisions to funding accounts, schedules, and other documents.

WBS 1.2.3.2.8 Preclosure Tectonics

OBJECTIVE

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

WBS 1.2.3.2.8.3 Vibratory Ground Motion

OBJECTIVE

To develop a seismic-design basis for repository facilities that are important to safety. Provide other information that will facilitate the assessment of the adequacy of the seismic-design basis and the identification of credible accidents that might be initiated by seismic events and lead to the release of radioactive materials. (SCP Investigation 8.3.1.17.3)

WBS 1.2.3.2.8.3.1 Relevant Earthquake Sources

OBJECTIVE

To identify and characterize those earthquake sources that are relevant to a deterministic seismic hazard analysis of the site (i.e., those sources that could be active) and, if active, could cause severe ground shaking at the site. (SCP Study 8.3.1.17.3.1)

SCP 8.3.1.17.3.1.1 Identify relevant earthquake sources 0G32831A93

Summary Account Manager - S. Pezzopane

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSS002 Identify (preliminary) relevant Earthquake sources

S. Pezzopane, hired this month, completed GET and GERT training, worked on QA reading assignments and attended a field trip to Yucca Mountain.

Variances:

3GSS002 Identify earthquake sources

3GSS101A Compile information from existing sources

Work on these activities did not start on schedule pending QA training of new staff.

SCP 8.3.1.17.3.1.2 Characterize the 10,000 year cumulative slip earthquake 0G32831B93

Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSS118A Evaluate and revise deterministic seismic hazard methodology

A contract was put in place for an expert from Geologic Division to work with and advise Yucca Mountain project staff. Discussions of alternative ways to analyze deterministic seismic hazard methodology were initiated. QA training and a field trip to familiarize participants with Yucca Mountain and the tasks at hand were conducted. Participants examined most trench excavations and reviewed preliminary findings at each trench.

WBS 1.2.3.2.8.3.3 Ground Motion From Regional Earthquakes and Underground Nuclear Explosions

OBJECTIVE

To select or develop ground-motion models that are appropriate for estimating ground motion at the site from earthquakes and UNEs. (SCP Study 8.3.1.17.3.3)

SCP 8.3.1.17.3.3 Ground motion from Regional earthquakes and UNEs 0G32833A93

Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GES010 Develop earthquake ground motion methodology

A team of four experts has been identified and assembled to evaluate and choose appropriate models for ground motion at the Yucca Mountain repository, and is scheduled to convene in May to prepare a study plan.

Variances:

Planned finish for this study may be delayed because personnel working on this study must wait for NRC to develop guidelines for evaluating ground motion models.

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

OBJECTIVE

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

SCP 8.3.1.17.3.4.1 Determine site effects from ground motion recording 0G32834A93

Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSG101A Gather seismograms from prior studies

Assembled recordings made at UNR portable stations near Yucca Mountain for over 100 earthquakes. Requested explosion seismograms recorded at Yucca Mountain from Sandia National Laboratory.

3GSG102A Gather geological and geophysical site information

Gathered information on the structure beneath Yucca Mountain, especially Midway Valley where surface facilities are proposed.

3GSG103A Develop initial standard ground motion model

Made an extensive literature review of strong ground-motion studies.

3GSG250 Conduct seismic field experiment #1

Examined the cluster test results in a qualitative manner for indication of site effects at Yucca Mountain.

WBS 1.2.3.2.8.4 Preclosure Tectonics Data Collection and Analysis

OBJECTIVE

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

WBS 1.2.3.2.8.4.1 Historical and Current Seismicity

Principal Investigator - J. Brune

OBJECTIVE

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

SCP 8.3.1.17.4.1.1 Compile historical earthquake record 0G32841A93

Summary Account Manager - J. Brune

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSM100 Develop method - Peak ground acceleration

Made surveys for additional precarious rocks near Yucca Mountain and in other parts of Nevada.

SCP 8.3.1.17.4.1.2 Monitor current seismicity 0G32841B93

Summary Account Manager - J. Brune

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GSM134A Monitor FY93 seismicity

Recorded data from SGBSN for all of March, except approximately 20 hours due to a disk problem. Develocorders provided backup during the down time. No events were missed. UNR completed the earthquake event bulletin through March 27, 1993. Four temporary stations were deployed near Beatty, NV to reverse a refraction line under Yucca Mountain to constrain crustal velocities in the vicinity of Yucca Mountain. The microwave telemetry station at Slide Mountain was upgraded.

3GSM148A Data analysis Little Skull Mountain Earthquake

Analysis completed on the cluster test to close out the Little Skull Mountain data recording experiment. Began routine focal mechanism determinations for Little Skull Mountain events.

Quality Assurance:

3GSM134A Monitor FY93 seismicity

Successfully completed new seismic instrument calibration procedure for one station; several others pending analysis. Nine personnel met with USGS Data Coordinator for data training on March 10. Software Identification Requests were submitted for two programs CALIB-SGBSN and REF2SEGY.

Planning and Operations:

3GSM134A Monitor FY93 seismicity

Several days were spent planning and cost-estimating for digital seismic upgrade.

WBS 1.2.3.2.8.4.2 Location and Recency of Faulting Near Prospective Surface Facilities

Principal Investigator - J. Whitney

OBJECTIVE

To identify appropriate trench locations to investigate the possible occurrence of late Quaternary surface faulting in the vicinity of planned critical surface facilities; and using surface and trench mapping, locate sites without evidence of significant late Quaternary faulting. (SCP Study 8.3.1.17.4.2)

SCP 8.3.1.17.4.2.1 Identify appropriate trench locations in Midway Valley 0G32842A93

Summary Account Manager - F. Swan

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GFP003 Mapping and soil descriptions in Midway Valley

Continued inspection and review of preliminary geologic mapping in Midway Valley.

Quality Assurance:

3GFP003 Mapping and soil descriptions in Midway Valley

An audit was conducted on March 11, 1993 (see section III below).

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

Several days effort went into preparations for an internal technical and programmatic audit conducted by SAIC/Golden personnel. Auditors included D. Cummings, D. Dahl, and J. Ziemba; T. Mendez-Vigo (SAIC) attended as an observer. The audit focused on documentation of trench logs and field notebooks, and on the presence of current revisions of controlled documents, criteria letter preparation, and programmatic considerations of Study Plan 8.3.1.17.4.2 within the context of project work.

SCP 8.3.1.17.4.2.2 Conduct exploratory trenching in Midway Valley 0G32842B93

Summary Account Manager - F. Swan

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GFP006 Assemble job packages for trenches

Work on this activity will continue as needed. No job packages required modification in March.

3GFP008 Excavate/log/study trenching near proposed ESF

Report preparation continued for the trenching investigations near the proposed ESF. Bedrock faults exposed in the "box cut" of the ESF portal were examined to determine their locations relative to faults and fractures observed in trenches (now backfilled) in the construction area.

3GFP021 Clean/modify/relog/study new logs from trench 17

Soil profiles were described at selected locations along the north wall of MWV-T4 during the March reporting period. The log of the north wall was reviewed, and changes to the log were made where necessary. Report preparation for MWV-T4 continued during the reporting period.

Variances:

3GFP016 Excavate/log/study extensions of trench A-3

Work on this activity did not start on February 16 as planned. Time and funding constraints may not allow study of the trench this fiscal year. During October and November of 1992, additional excavations and study of the area near the proposed ESF (activity 3GFP008) were required on the basis of prior work. This added work, plus planned work, had to be completed by November 23 so construction activities for the ESF could take place as scheduled. More persons were added to complete the fieldwork for activity 3GFP008 by the deadline, resulting in a higher rate of spending than was anticipated.

In addition, trench priorities have changed. Newly obtained geophysical data indicates that a fault may be present in the middle of Midway Valley. For purposes of study 8.3.1.17.4.2, a higher priority is assigned to the investigation of this possible fault than to the study of trench A-3. The location of a trench(s) across this possible fault will depend on the final geophysical interpretation and other information such as geologic mapping.

Based on these considerations, the priorities for excavation activities are being reevaluated within the context of this study and within the scope of other trenching activities scheduled by the USGS for FY93. The excavation and study of trench A-3 will depend primarily on trenching priorities still to be assigned and secondarily, on scheduling with REECo.

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

Several days effort went into preparations for an internal technical and programmatic audit which was conducted by SAIC/Golden personnel. Auditors included D. Cummings, D. Dahl, and J. Ziemba; T. Mendez-Vigo (SAIC) attended as an observer. The audit focused on documentation of trench logs and field notebooks, and on the presence of current revisions of controlled documents, criteria letter preparation, and programmatic considerations of Study Plan 8.3.1.17.4.2 within the context of project work.

WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain

Principal Investigator - J. Whitney

OBJECTIVE

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

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

Summary Account Manager - L. Anderson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTQ007B Compile map of Quaternary faults within 100 km / study Beatty scarp
Work on map compilation is nearly completed. A draft report on the origin of the Beatty scarp was started this month.

3GTQ033B Evaluate faults SW of Yucca Mountain
Evaluation of scarps and lineaments in the Amargosa Desert area was initiated using low-sun-angle aerial photographs. Field study of the Death Valley-Furnace Creek Fault Zone started on March 19.

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

Several days effort went into preparations for an internal technical and programmatic audit was conducted by SAIC/Golden personnel.

SCP 8.3.1.17.4.3.4 Evaluate Bare Mountain fault zone 0G32843D93

Summary Account Manager - L. Anderson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTQ065 Conduct detailed Quaternary surficial geologic mapping on the east side of Bare Mountain
Eight sites for soil pits, as well as two additional trench sites, were identified along the Bare Mountain fault as part of reconnaissance verification studies.

3GTQ060 Analyze trenches, Bare Mountain Fault Zone
Work on this task has started. Two trench sites have been identified and the documents prepared to obtain the necessary clearances. An archeology clearance has not been granted for trench BMT-1 (Tarantula Canyon site), and excavation and analysis are delayed until April.

Quality Assurance:

3GTQ060 Analyze trenches, Bare Mountain Fault Zone
Provided input into revision of existing test planning package T92-17 for evaluation of the Bare Mountain fault zone, required due to the selection of soil test pit sites and the identification of two additional trench sites along the fault zone. Also participated in audit NO. USGS-93-06 on March 11, 1993 (see section III below).

Planning and Operations:

3GTQ060 Analyze trenches, Bare Mountain Fault Zone
Led field trip for DOE support personnel so that additional permitting work can begin.

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

Several days effort went into preparations for an internal technical and programmatic audit was conducted by SAIC/Golden.

WBS 1.2.3.2.8.4.4 Quaternary Faulting within Northeast-Trending Fault Zones

Principal Investigator - J. Whitney

OBJECTIVE

To evaluate the potential for ground motion resulting from future movement on Quaternary left-lateral strike-slip faults located east and south of the site area. (SCP Study 8.3.1.17.4.4)

SCP 8.3.1.17.4.4 Quaternary faulting within northeast trending fault zones 0G32844Z93

Summary Account Manager - D. O'Leary

ACTIVITIES AND ACCOMPLISHMENTS

D. O'Leary participated in revision of QMP 5.01-R5 as technical advisor. (approximately 15 hours)

D. O'Leary also participated in the Total System Assessment Information Exchange and presented Tectonics Section activities to DOE. (Approximately 5 hours)

SCP 8.3.1.17.4.4.1 Evaluate the Rock Valley fault system 0G32844A93

Summary Account Manager - D. O'Leary

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTN011 Work on study plan / Conduct fieldwork Rock Valley fault system
Received study plan after USGS review. Conducted airphoto interpretation of newly acquired imagery and made plans for upcoming field work.

3GTN014 Develop interim report
Assembled necessary materials and made plans to write report in early April.

Planning and Operations:

3GTN011 Work on study plan / Conduct fieldwork Rock Valley fault system
Made arrangements for upcoming field activities.

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

Several days effort went into preparations for an internal technical and programmatic audit conducted by SAIC/Golden.

WBS 1.2.3.2.8.4.5 Detachment Faults

Principal Investigator - J. Whitney

OBJECTIVE

To provide information pertaining to the distribution, displacement rate, and age of detachment faults proximal to Yucca Mountain; and determine whether they represent a significant earthquake source or conceal a significant earthquake source at depth. (SCP Study 8.3.1.17.4.5)

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

Summary Account Manager - W. Hamilton

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTD017B Complete map of the Calico Hills / Write report
Additional compilation of field work continued. W. Simonds led a field trip into the Calico Hills for members of the USGS NTS environmental restoration project. Several persons were interested the Paleozoic stratigraphy, and low angle faults within the Paleozoic section.

3GTD009B Evaluate Miocene-Paleozoic contact
W. Simonds led a field trip into the Calico Hills for members of the USGS NTS

environmental restoration project. One person was interested in gravel deposits located at the Miocene-Paleozoic contact.

SCP 8.3.1.17.4.5.2 Evaluate postulated detachment faults in the Beatty-Bare Mountain area 0G32845B93
Summary Account Manager - W. Hamilton

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTD012B Evaluate and conduct mapping, Bare Mountain and Crater Flat

C. Fridrich commenced field work this month after hiring a field assistant. Together they are conducting geologic field mapping at the north end of Bare Mountain and at the southern end of Crater Flat.

3GTD005B Evaluate extension in Miocene rocks - Bare Mountain and Crater Flat

C. Fridrich, in the course of geologic field mapping, also is examining the structure of the area to determine the nature of Miocene extension.

Quality Assurance:

3GTD004B Collect field and lab data - Bare Mountain and Yucca Mountain

A scientific notebook plan was prepared to document the petrographic analysis of samples of metamorphic rock from Bare Mountain.

WBS 1.2.3.2.8.4.6 Quaternary Faulting within the Site Area
Principal Investigator - J. Whitney

OBJECTIVE

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

SCP 8.3.1.17.4.6 Evaluate Quaternary faulting within the site area LOE Account 0G32846Z93
Summary Account Manager - C. Menges

ACTIVITIES AND ACCOMPLISHMENTS

At least 32 hours were spent on basic administrative duties including: field scheduling and procurement of field equipment; installation of office computer equipment including installation of software programs; coordinating with YMP administrative personnel in hiring of new field assistant; completing IPA for A. Ramelli, to continue work on Solitario Canyon fault in FY93/94.

SCP 8.3.1.17.4.6.1 Evaluate Quaternary geology and potential Quaternary faults at Yucca Mountain 0G32846A93
Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GPF026A Complete field mapping / Submit map for review

Field work to collect data for the Quaternary fault map was completed this month and compiled on 1:12,000 scale orthophoto overlays. Drafting of the final map was initiated and a report outline was prepared.

Quality Assurance:

3GPF026 Complete field mapping / Submit map for review

Field notebooks used as sources of data were reviewed and prepared for TDIF submittal.

Variations:

The final map at 1:24,000 scale, along with its accompanying report, will not be submitted for USGS review on time. At DOE's request, the principal investigator worked on the erosion topical report. The other co-author similarly was needed to work on monthly and semi-annual reports.

SCP 8.3.1.17.4.6.2 Evaluate age and recurrence of movement on suspected and known Quaternary faults
0G32846B93

Summary Account Manager - C. Menges

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GPF19P Study faults on west & east sides of Busted Butte

Cleaning and flagging of identified stratigraphic contacts and structures was completed on exposure #4, on the west side of Busted Butte. The cleaned wall was photographed stereographically in preparation for mapping.

3GPF035A Study trenches excavated on Yucca Mountain faults

Re-photographed and surveyed Trenches T-8 and CF-1 in preparation for photogrammetric logging. (work needed to be redone following vandalism of 11/92) Completed arrangements for entry of trench logs into GIS data base (at EG&G) starting with trench 14D. Mapping of southern extension of trench 14D was delayed by wet conditions at the trench.

Quality Assurance:

3GPF029A Locate / excavate / log new trenches

Consulted with DOE field test coordinators on required procedures and schedules for initiating excavation of new trenches. Participated in USGS QA audit on March 11, 1993 (see section III below).

3GPF037A Study of scarp morphology on Quaternary faults

Technical procedure for field measurement of fault scarps was completed and is being submitted for technical review, (TP prepared by participants working on 8.3.1.17.4.3.2).

3GPF039A Study geophysical survey - Windy Wash Fault

Completed criteria letter required to initiate seismic refraction surveys included in this activity.

Planning and Operations:

3GPF19P Study faults on west & east sides of Busted Butte

Developed and printed photographic prints to be used as base maps for plotting contacts and structures.

3GPF035A Study trenches excavated on Yucca Mountain faults

Completed hiring of new field assistant for working with project staff on trench logging. This will accelerate logging of existing and new trenches in the coming year. Completed IPA for A. Ramelli to continue work on the Solitario Canyon fault in FY93/94.

3GPF029A Locate / excavate / log new trenches

Located field sites for a series of new trenches on the Solitario Canyon fault zone.

3GPF032A Scarp degradation and evolution north Windy Wash

Completed and approved contract for Los Alamos to conduct investigations of fault scarps on northern Windy Wash. Work scheduled to begin next month, following delays related to unscheduled work on the DOE erosion topical report.

3GPF039A Study geophysical survey - Windy Wash Fault

MOAs are in place to begin surveys as soon as criteria letters and environmental surveys are completed.

Variances:

Only part of the milestone (3GPF036M) was completed, with submission of the acquired data TDIF for the completed sections of trench 14D. The report on this was delayed by diversion of the principal investigator to unscheduled activities: technical assessment of ESF seismic design report (see section III).

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

PI was required by DOE to conduct a technical assessment of ESF Seismic Design Basic Working Group Report as part of Geology Working Group of the Technical Assessment Committee. This unscheduled activity required approximately one full work week.

Several days effort went into preparations for an internal technical and programmatic audit conducted by SAIC/Golden.

WBS 1.2.3.2.8.4.10 Geodetic Leveling

Principal Investigator - J. Whitney

OBJECTIVE

Evaluate possible historical and contemporary vertical displacements across potentially significant Quaternary faults within 100 km of Yucca Mountain. Characterize the historical rate of uplift and subsidence in the Yucca Mountain region, and evaluate the possible existence of tectonic boundaries that separate domains with differing rates of uplift and subsidence. (SCP Study 8.3.1.17.4.10).

SCP 8.3.1.17.4.10.1 Re-level base station network 0G3284AA93

Summary Account Manager - G. Perasso

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTM007J Continue to re-level network and resurvey quadrilaterals

Releveling activities continued this month. The releveling of the base line is 85% complete.

Variances:

3GTM007J Continue to relevel network and resurvey quadrilaterals

Task was delayed slightly by wet weather conditions. The task is near completion, however, and should be finished in the next few weeks.

SCP 8.3.1.17.4.10.2 GPS Base - station survey 0G3284AB93

Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Quality Assurance:

3GTM020 Resurvey GPS base stations

Project personnel are continuing work on a technical procedure for this study. Staff worked with QA specialists on software documentation and completed QA training.

WBS 1.2.3.2.8.4.12 Tectonic Models and Synthesis

Principal Investigator - J. Whitney

OBJECTIVE

To synthesize data relevant to tectonics; and to develop a model or range of models that establishes the causal relationship between application of tectonic forces and formation of structures observed at Yucca Mountain and vicinity; link observed rates of formation of those structures with regional rates of crustal strain; forecast changes in tectonic setting and the manner in which those changes will affect both the regional crustal strain rate and tectonic stability in the Yucca Mountain region; and estimate the effect of those changes on rate and nature of crustal strain at Yucca Mountain and vicinity and the future rate of tectonic processes at Yucca Mountain. (SCP Study 8.3.1.17.4.12)

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

Summary Account Manager - W. Hamilton

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTE072 Compile geologic map of the Death Valley area

Revision of the Death Valley map continued. Revisions to correct registration problems were made and the map sent back to the author for coloring.

SCP 8.3.1.17.4.12.2 Evaluate tectonic models 0G3284CB93

Summary Account Manager - W. Hamilton

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GTE045 Evaluate Tectonic models

Work on evaluating tectonic models is continuing. A draft abstract was prepared on techniques to evaluate tectonic models to be presented at the Site Characterization and Model Validation conference in September.

3GTE050 Perform boundary element modeling

A contract was finalized for a subject expert to do the work. No technical work has been done.

Variances:

3GTE050 Perform boundary element modeling

The start of this task is delayed until a subject expert is available to do the work.

WBS 1.2.3.3 Hydrology

Principal Investigator - D. Appel

OBJECTIVE

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

WBS 1.2.3.3.1 Geohydrology

OBJECTIVE

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

WBS 1.2.3.3.1.1 Description of the Regional Hydrologic System

OBJECTIVE

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

WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology

Principal Investigator - A. Flint

OBJECTIVE

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

SCP 8.3.1.2.1.1.1 Precipitation and meteorological monitoring 0G33111A93

Summary Account Manager - A. Flint

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

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

Data collection continued in March. Site data from the five weather stations were downloaded and reviewed each Monday. Satellite and weather chart data were archived on tape backup every three days, when possible. Problems with satellite data archival were corrected with replacement of a hard disk controller in the satellite data ingest terminal. The month of March was dry until the last week, a distinct change from the previous three months, and a complete reversal of the wet March of 1992. Only one major storm series hit the western U.S. during the month. Rainfall at Yucca Mountain averaged over 3/4 inch from storms on 26-28 March. These storms were the result of a sharp upper level trough of low pressure off the coast of northern California, spreading precipitation across most of California and Nevada.

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

All data collected using the local storage gage network from January 1st, 1990, through March, 1993, was compiled into a data base for statistical and geostatistical analysis of storm events. Approximately 50 significant storm events (average accumulation for Yucca Mountain greater than 2.00 mm) are included in this data base. Preliminary statistics for all storm events were calculated and analyzed, including storm sample distribution, sample variance, coefficient of variation, and the correlation between precipitation and gage elevation. Sample variograms were calculated for all significant storm events. The analysis

indicated a mixture of log-normal and normal distributions of total storm accumulations measured at 50 to 100 locations on Yucca Mountain. A maximum average storm total of 50.5 mm, and a maximum gage total of 71.1 mm, were recorded for a winter storm event ending on December 7, 1992. In general, coefficients of variation were less for winter season frontal-type storms than for summer season convective-type storms. Analysis of sample variograms also indicated characteristic differences between summer season and winter season storm events, with summer season storms characterized by greater variability and smaller ranges of spatial correlation relative to winter season events. This information will be useful for developing isohyetal mappings of storms as well as stochastic precipitation models needed for the analysis of natural precipitation.

Correlations of precipitation amounts with elevation were not high; however, a possible bias in the gage network may exist because the higher elevation gages tend to be more exposed. An increase in gage exposure may cause an increase in measurement error in terms of a deficit, especially during events with precipitation occurring as snow. This problem can be compounded when precipitation occurs as rain for lower elevation gages, but as snow for higher elevation gages.

Software was developed for using available digital elevation models to improve isohyetal mapping on both regional and local scales. Correlations between precipitation and elevation, and lightning and elevation, will be analyzed using the elevation data. The detailed (high density) elevation databases will also be used to analyze the influence of slope, aspect, and topography on precipitation. This will allow for a more thorough analysis of orographic influence on a regional scale and terrain effects (in terms of exposure) on a local scale.

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

Work was expended in support of the UZ Natural Infiltration Program. Soil moisture data were collected using a neutron moisture probe at six borehole sites. (6 hrs)

Precipitation samples were collected for other chemical analysis from some of the USGS collection gages. Samples were from the storms of March 26-28. (2 hrs)

Time spent supporting tours of the HRF 8 hours.

WBS 1.2.3.3.1.1.2 Runoff and Streamflow

Principal Investigator - D. Beck

OBJECTIVE

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

SCP 8.3.1.2.1.2.1 Surface-water runoff monitoring 0G33112A93

Summary Account Manager - T. Kane

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GRSO30A Complete FY83-85 data report

Revised data sets for the additional figures to be included in the report were submitted to the reports section in Carson City for final drafting. Release of the report to HIP should now occur in April.

3GRSO31A Complete reduction of FY86-89 data and preparation of report

Progress has been delayed in the reduction of FY86-89 surface-water data due to extensive field activities associated with runoff within the regional streamflow network caused by numerous storms during the months of January and February. The backlog of data collected has undergone initial screening and quality-control checks. This will allow our attention to be concentrated on this activity for the coming months.

3GRSO23A Collect FY93 runoff and streamflow activity

Runoff which occurred on the NTS during the month of March was a direct result of snowmelt which had accumulated during the January and February storms. Several measurements of streamflow were obtained at a proposed gaging site on Stockade Wash at Buckboard Mesa Road. These measurements along with a surveyed point of zero flow will be used to develop a rating to define the stage discharge relationship. Flow measurements were also made at Stockade Wash tributary near Rattlesnake Ridge. Off the Test Site measurements were made along the Amargosa River at Eagle Mountain and at the Tecopa gage. Levels for determining peak discharge by the Slope Conveyance Method were run at the Amargosa River below Beatty Hwy 95 gage, the Amargosa River at State Line proposed gage site, and at Carson Slough at State Line, for the January and February periods of runoff.

Precipitation for March averaged 1.5 inches as determined from network gages located on the NTS, while about 1 inch was reported for network gages located off of the NTS.

T. Kane and W. Nylund repaired the manometer orifice line on the Amargosa River gage at Tecopa. The channel above the culverts experienced significant filling due to sediment transported during the January and February storms, which buried the orifice.

Quality Assurance:

Quality assurance activities conducted by C. Martinez this month included: Work on TDIFs and grading report packaging, updating calibration procedures for levels, and overseeing QA reading assignments. (21 hrs)

Planning and Operations:

3GRSO28A Apply for site prerequisite survey

G. Ryder (DOE) was contacted several times during the month regarding permits for three new streamgage sites scheduled to be installed this year. Ryder stated a backlog of work compounded by a shortage of manpower has prohibited any action being taken on these sites. He has rescheduled this work for early April.

Variances:

3GRSO28A Apply for site prerequisite survey

Activity delayed until April 30, 1993 pending environmental clearances by DOE for the three new sites located on Yucca Mountain. This delay will cause activity # 3GRSO17A to be delayed one month as well. The activity has been and continues to be impacted by DOE's manpower problems.

3GRSO30A Complete FY83-85 data report

Activity delayed until April 30, 1993 due to continued refinement of the report by the Reports Section as requested by HIP, and the Nevada District Chief.

0G33112A93 RPT/TDIF: Streamflow and Precipitation FY83-35

Activity delayed until April 30, 1993 due to delay of activity 3GRSO30A.

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

T. Kane and C. Martinez attended a District reports writing class. (32 hrs)

T. Kane, C. Martinez, W. Nylund, and D. Bauer attended General Employee Radiological Training class (GERT). (16 hrs)

T. Kane, C. Martinez, W. Nylund, and D. Bauer attended a personnel training class [benefits workshop]. (48 hrs)

WBS 1.2.3.3.1.1.3 Regional Ground-Water Flow System

Principal Investigator - J. Czarnecki

OBJECTIVE

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

SCP 8.3.1.2.1.3 Regional ground water flow system LOE Account 0G33113Z93

Summary Account Manager - J. Czarnecki

ACTIVITIES AND ACCOMPLISHMENTS

Support Project Operations

J. Czarnecki conducted tests of paired Bowen-ratio humidity and temperature sensors in a controlled moisture and temperature environmental chamber at the USGS HRF in area 25.

J. Czarnecki represented the HIP SZ section during the Yucca Mountain Open House Public Tour at the HRF.

G. Buchanan and C. Savard completed Standard First Aid Training.

C. Savard completed General Employee Radiological Training

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 increased to document ongoing ground-water recharge from rainfall runoff events in Fortymile Wash. Project staff also assisted meteorology personnel in collecting rainfall readings from nonrecording gages.

SCP 8.3.1.2.1.3.2 Regional potentiometric level distribution and hydrogeologic framework studies

0G33113B93

Summary Account Manager - J. Czarnecki

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GRG011A Test small diameter wells

C. Buchanan and J. Czarnecki discussed plans to obtain 2000' of 4-conductor cable and instal a cable head for use with Bell-and-Howell transducers. The cable would be prepared for use in USW G-2 testing and in small diameter piezometers in the Amargosa Desert. Some cable has been located along with appropriate cable heads. Buchanan also obtained a bailed hydrochemical sample from a shallow PVC-plastic piezometer installed in borehole NA-9 in the Amargosa Desert.

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

J. Czarnecki reviewed borehole locations plotted on a 1:100,000 scale map with S. Keller (SAIC) to go over discrepancies between actual and plotted locations. No activity has occurred regarding an inquiry made for geophysical and lithologic logs from a mining company for 31 drillholes constructed in the Amargosa Desert. A contract to digitize any forthcoming logs was established. Any logs that are obtained will be evaluated and added to those contained in a draft report entitled "Lithologic and geophysical logs from U.S. Borax & Chemical Corporation exploration boreholes, Amargosa Desert, Nevada-California".

Planning and Operations:

3GRG054 Revise water level data report

Report is pending internal processing and approvals.

SCP 8.3.1.2.1.3.3 Fortymile Wash recharge study 0G33113C93

Summary Account Manager - C. Savard

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GRG021B Write/revise Fortymile recharge data report

Reports are behind schedule due to time needed to document ongoing recharge events during FY93. Time has been spent mapping the extent of surface-water runoff flows, collecting and processing water quality samples, measuring water-level responses in wells, measuring changes in unsaturated zone moisture content through neutron logging, and documenting and communicating field results.

3GRG026: Conduct ponding and infiltration tests

C. Savard installed and tested a water-level monitoring system at the UZN-85 Ponding Site operated by the UZ Infiltration-Artificial Recharge project.

WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling

Principal Investigator - J. Czarnecki

OBJECTIVE

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

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

Summary Account Manager - J. Czarnecki

ACTIVITIES AND ACCOMPLISHMENTS

F. D'Agnese, C. Faunt and J. Czarnecki prepared the monthly PACS report.

F. D'Agnese, K. Turner and J. Czarnecki attended a HIP PI/SA manager meeting to discuss related work activities.

F. D'Agnese, C. Faunt and E. Gutentag met with J. Watson to discuss QA procedures for upcoming vegetation mapping field trip.

F. D'Agnese and J. Czarnecki attended bimonthly SZ sectional PI meeting with D. Luckey.

F. D'Agnese and C. Faunt attended Total System Performance Assessment meeting (8 hrs) to discuss potential cooperation with contracting TSPA group.

J. Czarnecki met with K. Kipp (USGS CRR) to discuss characterization of the hydrology of Bonneville Salt Flats in Utah. Discussions included field and modeling studies related to playa environments. Also discussed was the capability of computer code HST3D (heat and solute transport in 3 Dimensions) to automatically change hydraulic conductivity as a function of increased temperature resulting in precipitation and dissolution of various mineral species.

J. Czarnecki attended a meeting of the Hydrology Integration Task Force at LLNL, February 14, 1993. The meeting was largely focused on the modeling work being done by T. Buscheck (LLNL) and others related to the extended-dry concept of nuclear-waste disposal and its potential impact on the UZ and SZ flow systems.

SCP 8.3.1.2.1.4.2 Subregional two-dimensional areal hydrologic modeling 0G33114B93
Summary Account Manager - J. Czarnecki

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GRM028A Draft report on preliminary simulation of large hydraulic gradient
J. Czarnecki ran simulations which examined the removal of the barrier to ground-water flow responsible for representing the large-hydraulic gradient north of Yucca Mountain on the NHPSUN computer. Mass balances were typically 5 to 6 orders of magnitude smaller than the maximum specified fluxes within the model indicating excellent mass balance. A run was made to obtain steady-state heads after 20,000 yrs; maximum difference between initial and final heads was 0.01 m. Output files were processed automatically using a UNIX script file which invoked the vi editor. Contour plots were successfully obtained of model results using a demo version of Surface III run in batch mode on the QCONHPDG computer.

3GRM031A Calibrate 2-D FE model

J. Czarnecki became familiar with the UNIX operating system on the NHP SUN computer. A finite-element computer code was successfully compiled and various simulations related to the large hydraulic gradient were run. Head-dependent sinks were incorporated into these runs using vertical-source/sink functions. Various script files were developed to handle a number of processes analogous to those on the QCONHP PRIME computer.

Variations:

3GRM028A Draft report on preliminary simulation of large hydraulic gradient
Activity is delayed until revised simulations can be run incorporating head-dependent sinks. All supporting script files for post-processing simulation results need to be converted from

PRIME CPL language to UNIX. All computer files have been moved from the PRIME computer to the HIP Sun computer. An additional delay will be incurred during the conversion of post-processing graphics software to run on the NHP SUN.

SCP 8.3.1.2.1.4.4 Regional three-dimensional hydrologic modeling 0G33114D93
Summary Account Manager - F. D'Agnese

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GFH022C Refine 3D hydrogeologic model

C. Faunt finished attributing all the faults and horizons on both the cross-sections and the surface.

C. Faunt began plotting the horizon data in three-dimensions. This data will be examined to find problems in the data before gridding. Some problems with the software upgrade were encountered.

C. Faunt began using CPS-3 to plot 3-D horizon data.

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. The report is being updated by incorporating earthquake epicenter data and statistical analyses.

C. Faunt and F. D'Agnese finished work on paper describing the development of the Hydrogeologic Map of the Death Valley Region. Turner is reviewing the map and text.

C. Faunt presented poster/presentation at the Waste Management '93 Conference, Tucson and will present it at the International High Level Nuclear Waste Management Conference, Las Vegas. Extra copies of the paper were made and sent to interested parties.

Intergraph Corp. delivered the software option required to extract the x-y-z coordinates defining the desired hydrogeologic units from the geologic 3-D cross-section and geologic map files in the MGE system. The extracted x-y-z data can then be evaluated by the CPS-3 software to create the needed subsurface geometry definitions. Some problems with the software upgrade were encountered.

3GRM041A Generate model input arrays

F. D'Agnese finalized preliminary vegetation maps and worked on report for "Regional vegetation mapping Death Valley region". A field trip has been scheduled for April 21 - May 3, 1993 to field check resulting density and land cover classes. A final map and report are planned for summer.

F. D'Agnese met with B. Sockriter to plan installation of the Calcomp Plotter, and made arrangements for the installation with Calcomp Corp.

K. Turner continued to complete draft report on the Amargosa Desert vegetation mapping originally conducted by L. DeMarco. Report is essentially complete and will be submitted for colleague review next month.

K. Turner reviewed regional vegetation classification maps developed by F. D'Agnese and helped outline report with E. Gutentag and C. Faunt.

F. D'Agnese continued terrain analysis for surface characterization (recharge, discharge, geomorphic, pedogenic, and hydrologic analysis). Work included developing average annual precipitation map of model area based on Quiring's regression.

F. D'Agnese completed water balance accounting for Death Valley Region based on earlier investigations (models and water resource studies). Fact is very few of the investigations agree.

F. D'Agnese conducted analysis of present-day discharge areas. Areas are being mapped for 3D model arrays. Areas include discharge from free-water, bare soils, wetlands/marshes, and phreatophyte areas. Comparisons were made with historical estimates by Rush, Harril, Maxey and Eakin, Malmberg, etc. and with published models.

F. D'Agnese spoke with D. LaCamera about estimates from the Nevada State Engineer of ground-water pumpage for key basins in the study area.

F. D'Agnese continued working with Brian Meier (Intergraph) to develop a 2.5 dimensional terrain model of the study area to be used in visualization of the 3-dimensional model, YMP tour demonstrations, and presentations.

C. Faunt continued preliminary development of code to translate ARC data into an ASCII format that would be readable by Intergraph's ASCII Loader software. ASCII Loader software was delivered this month.

F. D'Agnese continued work on regional potentiometric surface map. Preliminary regional water table maps were developed representing the potentiometric surface as both continuous and discontinuous. Map is being revised to include water table depressions at discharge areas. The map is also being compared to other published maps and topographic data. F. D'Agnese also discovered some software bugs in CPS-3 and arranged to have those bugs rectified with help from Radian Corp. (Austin, Texas).

F. D'Agnese continued developing layers for preliminary model (including two BCF layers, a recharge layer and a spring discharge layer) using GIS data base.

Methods on distributing hydraulic conductivity were reviewed including random analysis, stochastic conditional simulation, Bayesian statistics and deterministic methods.

F. D'Agnese worked with E. Swibas (Colorado District, Graphics) to develop means of generating photographic prints of image and map products from 3D modeling.

F. D'Agnese began preparing report on the Hydrogeology (Conceptual and Numerical Models) of the Death Valley Region.

F. D'Agnese continued analysis of regional spring discharge. This included analyzing spring discharge, temperature and chemistry to determine if spring was, indeed, a regional discharge component. Additional spring localities along the Amargosa River and at Carson Slough have been located. This activity, in conjunction with past discharge, will direct future sampling trips for faunal, isotope and chemical characterization of ground-water in area.

3GFH009C Continue testing with chemical models

Rockware Paper diagram software was ordered so further analyses could be performed on the hydrochemical data base.

Some initial contour map plots were produced using SURFER, and C. Faunt and D. Perfect continued the data transferrals needed to create map displays using Arc/Info.

D. Perfect has been conducting basic statistical analysis of hydrochemical data.

D. Perfect continued working on an Open-File Report of "Hydrochemical data in Death Valley Region".

3GFH014C Evaluate GIS methods

F. D'Agnese and C. Faunt began paper on the use of GIS for numerical ground-water modeling. Issues being tested involve input array generation, calibration and work flow.

Planning and Operations:

3GFH022C Refine 3D hydrogeologic model

The hard-disk on the Intergraph workstation at CSM failed. The disk was replaced by Intergraph field engineers (without charge). Data on the disk had been backed-up, so no information was lost. Assistance in reconfiguring the new disk by Intergraph personnel was necessary. The hard drive and all data were reconfigured and all operations are back to normal. Consequently the Intergraph machine was unavailable for about 3/4 the month. Work on model construction was delayed but not severely.

3GRM041A Generate model input arrays

C. Faunt, F. D'Agnese and K. Turner were contacted by M. Pearson (Intergraph) and informed that Intergraph would have a booth at IHLRMC in April and that they would like to demonstrate the Death Valley Regional Data set at that time.

Variances:

3GFH009C Continue testing with chemical models

3GFH009M Paper on structural flow paths

The paper on "Structural analysis of faults as conduits/barriers to ground-water flow" is late because it still is in colleague review. Final maps and figures are being prepared. Comments from colleague review are being incorporated into the manuscript. The report is being updated by incorporating earthquake epicenter data and statistical analyses.

WBS 1.2.3.3.1.2 Unsaturated Zone Hydrology

OBJECTIVE

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

WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration

Principal Investigator - A. Flint

OBJECTIVE

To determine the effective hydraulic conductivity, storage properties, and transport properties pertinent to unsaturated zone infiltration as functions of moisture content or potential; and to determine the present and to

estimate the future spatial distribution of infiltration rate over the repository block at Yucca Mountain. (SCP Study 8.3.1.2.2.1)

SCP 8.3.1.2.2.1 Unsaturated zone infiltration LOE Account 0G33121Z93
Summary Account Manager - A. Flint

ACTIVITIES AND ACCOMPLISHMENTS

Support Project Operations, FY93

Activities for March included preparation of monthly PACS, as well as the 6 month progress reports, which required approximately 8 hours for the 3 infiltration activities. W. Guertal was involved in our public tour and gave 4 1-hour small group tours of the HRF.

Training included GET renewal for M. Nash, GERT for W. Guertal, L. Hofmann and Nash and an 8 hour first aid and CPR training course for all infiltration researchers. QA reading assignments were completed. Two technical procedures (H-258 and HP-259) were revised following technical review, and a procedure for particle size analysis was revised and sent for typing.

A meeting was held to organize research topics and papers for presentation at professional meetings. Authors were agreed upon for papers to be presented at the annual Soil Science Society of America meeting and American Geophysical Union Fall meeting, and title summaries were drafted.

Neutron Moisture Monitoring FY93

All neutron holes were logged this month. In addition, all new boreholes (deeper than 50 feet) were logged to depth to provide information on any changes that may occur deeper in the profile on a 6 month time frame.

SCP 8.3.1.2.2.1.1 Characterization of hydrologic properties of surficial materials 0G33121A93
Summary Account Manager - A. Flint

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUI012 Collect/analyze consolidated/unconsolidated materials

The monthly experimental surficial moisture sampling project continued. All of the previous month's water potential and gravimetric water contents have been entered into spreadsheets. The spatial and temporal variations in surface moisture contents are being evaluated.

Four mapping/sampling transects of selected washes were conducted. In each transect, water content samples (2 depths; 0-15 cm and 15 m- 30 cm) were collected at selected locations. In addition, quick draw tensiometer readings were obtained at each of the sampling locations. At the same time, a preliminary depth to bedrock map for each wash was constructed.

One hundred tensiometers have been constructed for use in determining in-situ soil water potential. Two sizes of tensiometers were constructed; 15 and 30 cm lengths. These tensiometers will be installed in 4 separate transects in WT-2 Wash next month.

The ponding/infiltration experiment was carried out at Neutron access hole N-85. Results are described in the Artificial Infiltration report.

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

The preliminary surficial geomorphic map of the repository region has been completed for the area located between Northing 74200 and 56900 and Easting 55200 and 57900. Specific map unit descriptions and ground proofing of the map are currently being carried out.

SCP 8.3.1.2.2.1.2 Evaluation of natural infiltration 0G33121B93

Summary Account Manager - A. Flint

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUI305 Conduct water balance studies FY93

Work to finish, automate and install field tensiometers is ongoing. The tensiometers located at Pagany Wash and the N-85 ponding site are being monitored. The Bowen ratio station was serviced and data was collected.

3GUI307 Develop small scale watershed model

Organizational time was spent on this model to prepare presentation materials for the NWTRB meeting.

3GUI310 Evaluate shallow/deep infiltration process FY93

Field visits were conducted in early March to visually assess overland flow and runoff from precipitation events. Upper Pagany Wash had much runoff due to snow melt which reached the upper channels but did not proceed as far as the main channel below the fork. There was apparent flow under the surficial materials but along the surface of the bedrock, where it then dripped out into pools or small channels. Surface fracture flow was also apparent. There was runoff in several lower channels in other locations but it appeared localized and was evident due to deposition of fine materials.

The neutron logs from the 24 new neutron holes were plotted and received preliminary analysis. Several locations show evidence of historical differences in climate, as well as differences due to topographic position.

Time was spent in the preparation of presentation materials for meetings preliminary to the NWTRB meeting.

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

UZ16 was logged, using the large neutron tool, to provide J. Rousseau with information on the water table. The logs were run in the uncased borehole and will provide information to evaluate whether the dual-spaced tool can be used in a larger, uncased hole and if it is field calibrated using the core sample volumetric water contents. The calibration using the standards results in a very flat curve with very little resolution. (8 hrs)

SCP 8.3.1.2.2.1.3 Evaluation of artificial infiltration 0G33121C93

Summary Account Manager - A. Flint

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUI636 Conduct infiltrometer study/prepare OFR

Three ring infiltrometers and water storage tank systems were installed inside the larger infiltration ring at Neutron access hole N-85. These infiltrometers were used during the

prototype ponding study. The infiltrometer and water storage system performance was outstanding. Water head levels in the inner rings was maintained ± 1 mm for the duration of the experiment. The pressure transducers detected water level changes of 1 mm in the water storage tanks. No hydraulic connection was observed between the inner and the outer infiltration rings. Infiltration rates, infiltration capacity, and saturated hydraulic conductivity were calculated for each of the rings following the completion of the infiltration experiment.

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

The prototype ponding/infiltration study was conducted at the N-85. The infiltration experiment began March 9, 1993 and water was ponded on the site until March 24, 1993. A total of 13,000 gals. of water infiltrated through the surface soil during this time period. Neutron logs were taken every hour for the first 60 hours and then at selected time intervals, for a total of 350 hours. The neutron logs showed the various stages of the wetting front as the water moved through the various stratigraphic units. By neutron logging every hour, during the first 60 hours, a detailed picture of the wetting front was obtained. The logging interval for the next 290 hours detected the pulses and surges of the wetting front as it advanced downward. The wetting front reached a depth of 5.4 meters and the volumetric water content of the alluvial profile increased by approximately 15% throughout the infiltration region.

Time-domain reflectometry (TDR) traces were collected from the various probe sets which had been installed at N-85. Data from the traces showed the rate at which capillary water moved outward from the large infiltration ring. For the most part, the volumetric water contents, as determined by TDR, compared favorably to the neutron logs. However, three sets of probes gave erroneous readings. These probes had been placed in caliche horizons. This suggests that additional research into the influence of carbonates on TDR measurements is needed.

WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study

Principal Investigator - J. Rousseau

OBJECTIVE:

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

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

Summary Account Manager - M. Chornack

ACTIVITIES AND ACCOMPLISHMENTS

Support Project Operations

Full-day interviews were arranged by Foothill Engineering for three candidates seeking positions at the HRF.

Job offers were made to J. Curtis and M. Moreno, which they accepted. Moreno will start work April 19, 1993; Curtis will start April 26, 1993.

Job descriptions for summer student help funded by DOE from University of Nevada, Reno (UNR) were tentatively approved. The positions consist of an infiltration hydrologist to help Bill Guertal on the artificial infiltration studies, a computer scientist to assist Bill Davies set up the GIS data base on the SPARC workstation, and a petrographer/petrophysicist to help make thin sections and look at the relationships between pore geometry and hydrologic properties in the unsaturated zone. Attractive candidates have been found for all three of these positions, and the PD's were sent to the administrative section for processing.

A manuscript from P. Nelson in the Geologic Division was technically reviewed at his request by D. Soeder. It is an overview of the relationships between rock permeability and porosity determined from wireline logs. The 60-page document was returned with comments. Approximately 8 hours were spent on the review.

A revised chemical inventory in the Hydrology Lab (Rm. 111) was conducted by D. Soeder, which updates the Chemical Hygiene Plan for this laboratory for 1993.

The 6-month Site Characterization Progress Report #8 was written by D. Soeder for the rock matrix-hydrologic properties testing project. It was reviewed by A. Flint and forwarded to M. Chomack.

Training in March:

First Aid/CPR Training, Las Vegas, 3/3/93, 8 hours, Soeder & Hudson; GERT Training, NTS, 3/15/93, 2 hours, Hudson; Procurement Integrity Training, Denver, 3/17/93, 4 hours, Soeder; GERT Training, NTS, 3/22/93, 2 hours, Soeder;

March tours:

University of Goteborg (Sweden), 3/2/93, 0.5 hour, Soeder; Beatty Breakfast Club, 3/4/93, 1 hour, Soeder; University of Colorado, 3/8/93, 1 hour, Soeder; Yerington (NV) High School, 3/11/93, 1 hour, Soeder; Guy Arlotto-NRC, 3/23/93, 0.5 hour, Soeder; YMP Open House-Public Tour, 3/27/93, 4 hours, Soeder; Eureka & White Pine Counties (NV), 3/29/93, 1 hour, Soeder; Las Vegas News Media, 3/31/93, 1 hour, Soeder; GreenPeace, 3/31/93, 0.5 hour, Soeder & Guertal.

HRF Borehole Monitoring and Sensor Recalibrations

Continued monitoring of HRF boreholes; prepared monthly PACs status reports for February, 1993; prepared 8th semi-annual progress report for October 1, 1992 - March 31, 1993; prepared presentation for NWTRB meeting, entitled "A features-based drilling approach for deep percolation studies at Yucca Mountain, Nevada"; continued fabrication of reel rack units for stemming and instrumenting Deep UZ boreholes; inventoried all components of the 82 DISAs (downhole instrument station apparatuses) that were delivered in February, (delivery was short 82 mounting brackets, supplier will supply short items at no additional cost); request for bid and contract for IIS was delivered to R/P International, Lincoln Heights, Ohio, (contract is for 15 IIS to be delivered over a five year period. Deadline for bid submittal is April 30, 1993); prepared position description and requested hire of computer programmer to replace position left vacant with termination of IDAS software development; staff members attended GERT training, procurement integrity training, CASY symposium, and Performance Assessment meeting; reviewed RSN USW UZ-14 borehole work program; prepared abstract for the SEG meeting to be held in Washington, D.C., in September, (paper summarizes the results of VSP computer and physical model simulations of Yucca Mountain, Nevada. Technical reviews were conducted. Changes to original were made to comply with reviewer comments.); abstract submitted to the Fourth TIE Workshop,

DOE, in Oak Ridge, Tennessee was accepted, it will be presented in mid-May and summarizes research on thermocouple psychrometers; completed fracture mapping of UZ-16 borehole core - preparing summary report; request to terminate further development of IDAS software was approved; met with representatives of Frank Casing Crews in Lafayette, Louisiana, to review requirements for multiple tube string slips and elevators that will be needed for VSP and hydro-instrumented boreholes; submitted purchase requisition for measurements of P- and S-wave velocities on core samples from UZ-16; prepared sole-source procurement and specifications in conjunction with preparation of the purchase requisition; criteria letter for UZ-4, -5, -7, & -13 instrumentation in final review pending resolution of line power issue. Expect to submit criteria letter no later than end of April; prepared purchase requisitions for special core chambers in which to measure water potential using the Deep UZ's special 6-wire psychrometer configuration; UZ-6s report resubmitted to manuscript section for final assembly and publishing; and have encountered massive problems with the pressure transducer order (100 units initially). Reston may have to be involved. Award of the contract will probably be delayed for another 30 to 60 days.

Air-K Testing

The technical review comments on the Major Faults testing in the ESF were addressed and sent back to the reviewer.

SCP 8.3.1.2.2.3.1 Matrix hydrologic-properties testing 0G33123A93

Summary Account Manager - D. Soeder

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUP005A Measure rock properties/state variables FY93

Preserved (canned) core samples were received for the UE25-UZ16 borehole in March. A group of samples from depths of 32 feet to 500 feet was received on March 10, and a second group from depths of 1408 feet to 1685 feet was received on March 25, 1993. Samples from this second, deeper group were analyzed through the HP-229 procedure starting on March 29, 1993. This portion of the core intercepted the water table in the borehole.

3GUP015A Determine matrix permeability FY93

Matrix permeability measurements have now been completed on 23 runs of samples from the Prow transect, and data interpretation has been finished on 16 of these. Due to the continuing lack of laboratory technical assistance, the throughput of non-QA samples on the low-pressure permeameter has been reduced to allow time to finish writing a technical procedure, so the apparatus can be used to run Quality-Affecting core. The construction of the new, high-pressure permeameter system for very tight rock samples also has been on hold, but it is expected that the addition of new lab personnel in April will allow the assembly of the device to proceed.

3GUP031A Determine moisture characteristic curves FY93

Moisture characteristic curve measurements in the chilled-mirror CX-2 psychrometer are continuing on samples of fine soil (<2 mm size fraction) and coarse fragments (> 9.5 mm size fraction) as well as mixtures composed of varying percentages of the coarse and fine fractions. A number of soil samples were sieved, and moisture characteristic curves were measured on four size fractions using the CX-2: <2 mm, 2 mm - 4.75 mm, 4.75 mm - 9.5 mm, and >9.5 mm. Curve fitting calculations were done on water retentions measured on cores from the N-55 borehole as part of the INTRAVAL project. The Quality Affecting technical procedure for the CX-2 instrument has been tentatively approved by HIP-QA. Use

of the CX-2 for Quality Affecting work will not be possible, however, until REECo can get their temperature calibration standard approved by YMP or another approved vendor is found for temperature calibration.

SCP 8.3.1.2.2.3.2a Surface-based boreholes studies 0G33123B93

Summary Account Manager - J. Rousseau

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUP053A Drill UZ boreholes

UZ-16 drilling completed on March 12, 1993. Work package for UZ-14 reviewed. LM 300 rig is being relocated to the UZ-14 drill site. Drilling start date is unknown.

SCP 8.3.1.2.2.3.2b Vertical seismic profiling 0G33123C93

Summary Account Manager - J. Rousseau

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUP081B Conduct VSP prototype field test and analysis

Several hundred source-receiver crosshole data sets were acquired at the Idaho Springs, CSM Experimental Mine. Additional data sets still are being acquired and a "first-go-round" inversion attempt will be made in April. Optimism about the inversion results is not high; the crosshole data are noisy and the source arrivals are weak. In an effort to produce an improvement in signal-to-noise ratio, arrangements are being made to use a wall-locking geophone and vice hydrophones to sense the seismic signal. However, acquisition will be much slower with this method.

Planning and Operations:

3GUP084B Provide velocity measurements UZ-16 core

PBT Laboratory has provided the information requested by the Quality Assurance Office for certification determination.

SCP 8.3.1.2.2.3.2c Integrated data acquisition system 0G33123D93

Summary Account Manager - J. Rousseau

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUP072C Develop, test, review, and integrate software

The DOE Project office approved termination of IDAS software and conversion to a PC-based system. The new data acquisition program is ready for testing. Two other support programs have been written and tested. Work is continuing on the programs to handle the output data.

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 17 months and continue to provide reliable data.

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

Summary Account Manager - G. LeCain

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUP031D Prepare/test/write report for UZ-16 air-k

Instrument wiring in the surface support trailer has been completed between the reel slip rings and the office. Only electrical wiring remaining is the connections to the packers. The pneumatic system is 80% complete; remaining 20% will be completed upon arrival of required parts. A memo was received from the USBR which outlined the boom reinforcement required in order to operate the boom safely. The necessary steel has been purchased and the boom will be reinforced the first part of April. A third axle for the trailer was ordered and delivered. The axle will be installed during early April.

Planning and Operations:

3GUP033D Construct and test backup packer assembly

Continued investigating possible suppliers of packers for the backup packer assembly.

Variations:

3GUP032D Prepare/test/write reports for UZ air-k testing

The testing of UZ-16 is behind schedule because the borehole was not completed until the end of March. The PI has to assume all responsibilities for construction and testing of the equipment. The PI has scheduled the equipment to be completed and ready for field use on June 14, 1993.

WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study

Principal Investigator - M. Chornack

OBJECTIVE

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

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

ACTIVITIES AND ACCOMPLISHMENTS

Support Project Operations, FY93

Staff meetings for the FRHP were held to discuss detailed and routine project operations.

Comment resolution of technical review of USGS-HP-250, "Intact fracture sampling, radial sampling" was completed. However, continued to resolve HIP QA review. Response to QA comments were written up and submitted to J. Woolverton.

Prepared February PACS and LOE reports.

B. Britain, computer systems analyst, started work on March 1, 1993. Most of the administrative paperwork and training for work in the YMP has been completed. He has started with familiarizing himself with the FRHP studies and in particular, the thermocouple psychrometer calibration data collection program.

Prepared and processed considerable number of purchase requests.

The slab saw in the laboratory is being converted from using water as the cutting fluid to air. This is for the benefit of the FRHP as well as the UZ hydrochemistry project. The air duct plenums/adapters were installed for the laboratory dust collection system. When checked, the dust collection system failed to operate properly with the slab saw. The penetration into the saw was too small to pull enough volume. A new, larger penetration was made through the wall of the saw and it now will operate with air as the cutting fluid. M. Beasley, UZ hydrochemistry helped complete the modifications to the slab saw. This saw will be modified further for use by the FRHP to be able to use a 24-inch diameter saw blade.

The six-month, SCP progress report was completed and submitted.

GERT training was attended by L. Anna, F. Thamir, G. Severson, and S. Anderton; Anna, Severson, and Thamir attended the Summary Account managers meeting and UZ section meeting for PIs and Project Chiefs; Anna and Severson attended the procurement integrity course; Anna attended the two day CASY symposium, the CCC meeting to review software, the audit meeting for activity 8.3.1.2.2.8.1, and the Performance Assessment meeting; and Severson attended several of the CASY symposium talks.

The Survey of Planned Acquisition of Computer Hardware, Software, and Telecommunications Equipment needed for FY94 was completed for the percolation and intact-fracture tests in the ESF and submitted.

S. 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 being re-calibrated to check for drift during the experiment. This was started in March and continues into April.

Changed filters in ultrapure water system in laboratory; obtained a glove box from USGS surplus in Bldg 810. This glove box is being cleaned up and re-furbished for use in the imbibition experiments for the Percolation Test.

L. Anna began rewriting QMP 3.03 to conform to the new QARD standards.

F. Thamir began writing a technical procedure on calibrating and using thermocouple psychrometers and one on calibrating pressure transducers.

SCP 8.3.1.2.2.4.1 Intact fractures testing in the ESF 0G33124B93

Summary Account Manager - G. Severson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUS015J Complete journal paper: detailed moire

This draft is still being written. Presently, this paper should be submitted to the HIP reports section for formal technical review in April 1993.

3GUS020J Design and conduct tests

Consideration was given to the design of the tests to be conducted under this activity. The configuration of the test set-up was discussed and still is being detailed. The actual start of testing under this activity is dependent on the completion of activity 3GUS028J below.

3GUS024J Complete OFR on projection moire

Progress toward this "final report" continues. A draft of this OFR will be submitted for review after activity 3GUS015J above is completed. This draft should be submitted sometime in May 1993.

3GUS028J Design/fabricate vessel

Most of the pieces for the low-pressure vessel have been completed. One radius on one of the drawings still is considered an o ring seal (original seal) rather than a poly pak seal that was finally decided upon. This one piece remains to be machined and presently there is a materials delay. Fabrication of the LVDT mounting brackets for displacement measurements will begin, and should be completed, in April. Some of the plumbing hardware has been received but, a considerable number of items still need to be obtained.

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

The "north test pit" (test pit #1) at Fran Ridge, Yucca Mountain, NV has been inspected and could be used as a possible sampling site. However, discussions concerning the mapping work (USBR) to be done in this pit still indicate that this work will probably not be completed during FY93 due to budgetary restraints.

SCP 8.3.1.2.2.4.2 Percolation testing in the ESF 0G33124B93

Summary Account Manager - F. Thamir

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUS034B Prepare analytical report on imbibition experiments

An experiment was repeated on one fractured core where the water flow rate through a fracture at different pressures was measured. The repetition was required to verify effects of barometric pressure fluctuations on water flow rate through fractures. These effects were observed in a previously conducted experiment. Results indicate that as the barometric pressure rises, flow rate increases, and vice versa. This effect will be studied and included in the report. Another factor that appeared to significantly affect the hydrologic properties of water flow through the fractured sample was bacterial and algae growth. Bacteria does occur in the unsaturated zone; however, the types and concentrations in the Yucca Mountain region have not been thoroughly studied. Further information regarding this effect will be reported next month.

3GUS033B Prepare prototype percolation test report

Prepare slides for paper presentation at the 1993 International High-Level Radioactive Waste Management Conference in Las Vegas, Nevada. The paper is entitled "Laboratory study of water infiltration into a block of welded tuff" by F. Thamir, E. Kwicklis, and S. Anderton.

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

ACTIVITIES AND ACCOMPLISHMENTS

Variances:

3GUS0410 Design/construct/test borehole packer system

The Central Region Purchasing Office has the paper work for purchasing the prototype ESF borehole liner system needed to conduct air-permeability testing. The purchasing officer has notified HIP that Purchasing will not be able to award the contract until August or September. The original schedule called for the contract to be awarded by January 30, 1993. This means the schedule has slipped seven to eight months.

SCP 8.3.1.2.2.4.7 Perched water tests in the ESF 0G33124G93

Summary Account Manager - M. Chornack

ACTIVITIES AND ACCOMPLISHMENTS

Quality Assurance:

3GUSO12G Begin monitoring ESF for perched water

The technical review of HP-260 "Hydrologic testing, monitoring, and sampling perched-water zones in the Exploratory Studies Facility" was completed and approved for distribution.

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

Technical review of HP-260 required a reorganization of section 4.

SCP 8.3.1.2.2.4.8 Hydrochemistry Tests in the ESF 0G33124H93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUS403 Research gas-sampling system

A requisition has been prepared for a Commerce Business Daily advertisement for the borehole liner contract. It is expected that the contract may not be awarded for six months.

WBS 1.2.3.3.1.2.6 Gaseous-Phase Movement in the Unsaturated Zone

Principal Investigator - M. Chornack

OBJECTIVE

To describe the pre-waste-emplacement gas-flow field; to identify structural controls on fluid flow; to determine conductive and dispersive properties of the unsaturated zone for gas flow; and to model the transport of water and tracers in the gas phase. (SCP Study 8.3.1.2.2.6)

SCP 8.3.1.2.2.6.1 Gaseous-phase circulation study 0G33126A93

Summary Account Manager - M. Chornack

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GGP06B Plan tracer tests in selected UZ boreholes

Conducted scoping studies in shallow sample collection boreholes at Yucca Mountain. This information will be used in planning the tracer tests to be conducted in boreholes USW UZ-6 and USW UZ-6s. Attempted to meet with the UNLV consultant who is conducting the tracer gas studies for the state of Nevada.

3GGP02B Collect UZ borehole data - FY93

Tubing was installed in boreholes USW UZ-6 and USW UZ-6s for gas sample collection. Selected neutron-access boreholes were fitted with gas sample collection equipment. Gas samples for isotopic composition analysis and gas samples for carbon-14 analysis were collected. Isotopic samples were collected using peristaltic pumps and syringes, and analyzed in a gas chromatograph. The carbon-14 samples were collected by passing the rock gas from the boreholes through a KOH solution. These samples are being analyzed in the carbon-14 laboratory at SMU. A thermocouple bundle remains in borehole USW UZ-6s.

3GGP04B Tabulate and analyze gas samples

Began analysis of gas composition data collected from boreholes. Continued to analyze previously collected gas flow data and shut-in pressure data.

Planning and Operations:

3GGP08B Plan modeling and gas flow interference tests

Gas-flow data collected from borehole USW UZ-6s are being prepared for utilization in the 3-D gas-flow and -transport model. Gas chemistry data collected from boreholes USW UZ-6, USW UZ-6s, and selected neutron-access boreholes are also being analyzed.

WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry

Principal Investigator - A. Yang

OBJECTIVE

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

SCP 8.3.1.2.2.7 Unsaturated-zone hydrochemistry LOE Account 0G33127Z93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

Conduct Information Seminars on Model for Project Staff

Two seminars were held in March, beginning to work with the reaction path modeling program, PHREEQE.

Procure, Test Borehole Sampling System (12" Hole)

A 12 1/2 inch packer system will be needed to collect gas from up to 15 zones in unsaturated zone boreholes. One possibility is a straddle packer system (as tested at UZ16); another possibility is a Seamist system. Procurement of the 12-inch Seamist system is needed to test it at a UZ borehole at Yucca Mountain.

The packer system has been constructed and is awaiting testing.

Contract for Seamist was advertised in Commercial Business Daily. The contract is expected to be awarded in approximately six months.

Prepare Hydrologic Procedures, FY93

Prepare hydrologic procedures or scientific notebook plans for pertinent activities. These may include, but are not limited to: Packer use procedure, KOH collection of CO₂ procedure, tracer auto injection system procedure, vertical Seamist use procedure, use of mass flow controllers procedure.

Project personnel wrote or revised technical procedures HP-07, -160, -175, -248T, -252, -260, and -262. HP-07, -160, and -262 received final acceptance this month.

A. Yang reviewed technical procedures for J. Whelan's group on shallow soil-gas sampling procedures. Yang also reviewed technical procedures for core-sampling sealing.

J. Higgins completed a technical review of HP-259, R0, entitled, "Determination of bulk density using an irregular hold bulk density sampler".

Support Project Operations, FY93

Planned and scheduled project operations, completed monthly PACS report, prepared budget estimates, prepared procurement documents, and tracked spending.

Project personnel attended the two-day CASY seminar on thermal loading.

C. Peters attended Performance Assessment meeting; prepared plan for UZ16 study, and organized, purchased, and arranged the equipment for the field work.

C. Peters and M. Beasley prepared the cube van for trip to field and hauled UZ16 core to Denver from NTS.

All UZ-hydrochemistry project members 1) completed QA reading assignments; 2) prepared the monthly progress report; 3) attended GERT; and 4) attended UZ hydrochemistry information seminars and continued learning to use geochemical models.

J. Higgins completed reading assignments for QMP 5.05, R3; 4.01, R4; and 7.01, R5.

A. Yang responded to DOE/Las Vegas comments on Study Plan 3.2.1.2.2.7, R1, and revised the Study Plan.

J. Higgins worked with USGS QA personnel to prepare a TDIF for the draft WRIR entitled "Pore-water extraction from unsaturated tuff by triaxial and one-dimensional compression methods, Nevada Test Site, Nevada."

A. Yang was assigned to a team to develop a quality management procedure to address the QARD DOE/RW-0333P, Rev. 0 requirements concerning nonconforming samples, and attended two meetings in March.

Members of the UZ-Hydrochemistry group attended the Mendenhall Lecture Series presentation by Issac Winograd entitled "Roles of intuition, luck, and non-canceling unknowns" on March 26, 1993.

P. Striffler and A. Yang met to discuss building degassing in the HRF laboratory.

J. Ferarese completed the TDIF package for borehole UZ1 for the period May 1989 - January 1991. This TDIF package had originally been sent in October 1991, but it was requested by QA that UZ1 TDIF package be separated into pre-May 1989 and post-May 1989. Remaining to be completed is the pre-May 1989 package. When the UZ1 interpretive and data reports are completed, a developed TDIF package with all of the raw data notebooks will be submitted.

As the HIP Chemical Hygiene Officer, J. Ferarese has prepared a package containing HIP laboratory chemical hygiene plans and chemical inventories and sent it to the regional safety office. This requirement puts HIP in compliance with OSHA regulations for the 1993-94 period.

G. Rattray performed additional technical reviews on HP-07 to satisfy QA reviewers; modified the BPO with Scott Specialty Gases to include DuPont certified Freon-related fluorocarbon calibration standards; reviewed HPs 7, 56, 160, 175, 176, 177, 178, 194, 131, 234T, 236T, 237T, 204, 239T, 240, 242, and 257 for upcoming UZ fieldwork; prepared HP-193T for semi-annual submittal for QA review; attended UZ hydrochemistry/WRD research field work coordination meeting; and attended a one-day first aid class.

SCP 8.3.1.2.2.7.1 Gaseous-phase chemical investigations 0G33127A93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUH011 Evaluate existing export models gaseous C-14 export

Continued attempts to find simple solutions to solid-phase distribution of ¹⁴C.

3GUH012 Prepare, analyze and tabulate data

Analytical results for gas samples collected from UZ-1 test holes for ¹³C/¹²C analysis were received. ¹⁴C samples were sent to Geochron Division of Krueger Company for analyses.

Prepared summary sheets and sample tracking forms for January 1993 UZ1 sample collection.

Fifteen (15) 300cc stainless steel storage cylinders containing CO₂ gas from borehole UZ1 were volume measured and sent to Geochron Laboratory for carbon-14 analysis, and five (5) water vapor samples from borehole UZ1 were analyzed for tritium.

3GUH013 Oversee drilling, collect gas and water vapor samples

The UZ16 drilling was completed. UZ-hydrochemistry personnel remained on site to prepare for packer set-up, transfer instruments to mobile lab, and begin gas and water vapor collection.

A. Yang and P. Striffler checked all UZ-boreholes at Yucca Mountain for their natural ventilation status. Most of the holes were discharging the rock gas.

J. Ferarese helped set up a gas chromatograph in the HRF and was involved with CO₂ collection and composition analysis of gas from borehole UZ6 and 6s.

J. Ferarese set up the ion chromatograph and gas chromatograph with the associated equipment and the data acquisition system has been set up in the mobile lab. Trouble was encountered in obtaining the proper grade of air required in operation of the FID detector. Because of this, the FID detector is not completely operable at this time. Ferarese will set up the FID when the proper gas arrives.

3GUH015 Prepare interp rpt/OFR: UZ1 gas and water vapor

A report entitled "Carbon isotopic data from test hole USW UZ-1, Yucca Mountain, Nevada" by A. Yang, C. Peters, and D. Thorstenson was prepared and accepted for presentation at the 4th Annual International High-Level Radioactive Waste Management Conference. The paper will be published in the conference proceedings.

3GUH014M Completion of packer system

Packer system construction was completed and shipped to test site for gas sampling at UZ-16.

Planning and Operations:

3GUH014 Design, build, and test equipment

Packer equipment was transported from Denver to USGS facilities at the test site. The packer handling system (winch, etc) was ordered. Packer bundles and a quick pump were assembled. Gas chromatographs and standard gases required for analyses for field tests are in place.

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

An estimated 56 hours were spent in support of the following tasks:

G. Rattray tested sorption of 50,000 ppm CO₂ atmosphere onto: (1) bedded tuff, Yucca Mountain Member tuff, and UZ5 Topopah Springs Member tuff; and (2) partly saturated (10% H₂O) gypsum cement, Tiva Canyon Member tuff, and Pah Canyon Member tuff. Rattray consulted with glassblower (R. Allen) about flask modifications needed in order to test uncrushed core samples for sorptivity. Also discussed was the need for additional testing of CO₂ adsorption/desorption with A. Yang and J. Rousseau. Rattray learned to operate, calibrate, and test operating conditions of SIP 1000 (portable CO₂ analyzer). (40 hrs)

G. Rattray reviewed USGS/WRD gas tracer needs with C. Peters, E. Weeks, and D. Thorstenson. Wrote memo to Stetzenbach outlining the USGS concerns with regards to gas tracer studies and the need for gas tracers that are well understood at the test site. (16 hrs)

SCP 8.3.1.2.2.7.2 Aqueous-phase chemical investigations 0G33127B93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUH035A Prepare report on effects of core sealing

Report was accepted for presentation at the High-Level Radioactive Waste Management Conference and will be published in the proceedings volume. Preparation of the oral presentation is continuing. The paper is in press.

3GUHO30A Export, prepare, extract, analyze core

Prepared memo to obtain remaining UZ16 core. These core samples will be transmitted to the USGS Denver Federal Center labs by P. Striffler and C. Peters in early April.

Performed pore-water extraction using distillation methods on two UZN-55 cores. The extracted pore-water will be analyzed for tritium, O ^{18/16} and D/H. Air-compressor water that was mixed with oil and sludge was distilled and will be analyzed for tritium. Some cutting samples collected during the ream cycle were distilled and will be analyzed for tritium.

Four new distillation systems using no grease on the stopcocks have been ordered. The design changes are minor. The new systems will have needle valves with o-rings in place of the stopcocks. The needle valves will be more efficient in maintaining a vacuum and will be easier to clean.

New standards were obtained to calibrate the carbon dioxide, potassium, and redox microelectrode probes which are used to analyze pore water from extraction tests.

Sixty-four (64) water samples from distillation and core-squeezing operations from boreholes UZ4, UZ5, and UZ6s have been prepared for shipment to the NWQL for deuterium/hydrogen analysis. There was a question in the past whether to analyze these samples. The PI has decided that they should be analyzed. Analytical request forms need to be completed before the samples can be sent.

3GUHO36A 3H and ¹⁴C method development report

J. Ferarese finished the report in February and it is now with the co-author. A. Yang completed editing and revising the manuscript. Report was completed March 31, 1993.

WBS 1.2.3.3.1.2.8 Fluid Flow in Unsaturated Zone Fractured Rock

Principal Investigator - L. Anna

LBL Principal Investigator - G. Bodvarsson

OBJECTIVE

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

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

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUF026 Model imbibition experiments

The experiment is presently being run with all systems operating. The experiment should be complete by the end of April.

3GUF022 Model large block percolation experiment

No progress on this activity during the reporting period because the data transformation to be used in the modeling is not complete.

Variations:

3GUF026 Model imbibition experiments

This activity has been delayed because the experiment was adapted to collect real time psychrometer data. The data collection should be complete next reporting period.

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

Compiled and analyzed data on fracture characteristics, including data from GSP activities, and began preliminary work on adapting fracture networks to modeling flow in the unsaturated zone.

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

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUF217L Complete semi-analytical methods report

Large portions of the text of the report/user's guide to the semi-analytical dual-porosity code have been written. The report will summarize our work on semi-analytical solutions to matrix imbibition problems, and their incorporation into the TOUGH code as source/sink terms.

Variances:

3GUF217L Complete semi-analytical methods report

This task was scheduled to end March 31, 1993, but is not yet finished. The report is now planned to be longer, more comprehensive, and more self-contained than originally envisioned. This delay will not affect other tasks, which do not require the written report in order to commence. The new planned finish date is May 31, 1993.

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

G. Bodvarsson, R. Zimmerman, T. Hadgu, and L. Tsao prepared for an audit by USGS QA which was performed at LBL, with J. Ziemba as the audit team leader. Most of the audit covered the handling of technical issues but the auditors also examined the LBL copy of the QMP.

WBS 1.2.3.3.1.2.9 Site Unsaturated Zone Modeling and Synthesis

Principal Investigator - E. Kwicklis

LBL Principal Investigator - G. Bodvarsson

OBJECTIVE

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

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

Summary Account Manager - E. Kwicklis

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUM002A Develop conceptual models of UZ, FY93

3GUM028A Conduct hypothesis tests/2-d cross-sectional models

No work was conducted under this activity in March because of unscheduled work related to modeling heat buildup and redistribution of moisture at the proposed repository due to heat

generated by radioactive decay.

Variances:

Numerical modeling was initiated, in February, to investigate to what extent the results of recently published thermal loading calculations are sensitive to the use of an effective continuum approximation for liquid, vapor and heat flow in thermal loading simulations intended to look at the effects of repository heat. Models were constructed using both an effective continuum approximation and a true dual-porosity approach to see if the high rates of condensate generation and dry-out, predicted by the effective continuum approximation, are significantly lowered by considering the finite amount of time required for liquid within the matrix blocks of a fractured medium to move the fracture walls. A comparison of the models showed that, for the matrix hydrologic parameters and fracture spacing assumed in the calculations, the two approaches yielded nearly identical results. Further sensitivity analyses are necessary to determine what combination of matrix properties, fracture spacing and heat load cause the results of the two methods to deviate significantly. Results were presented in a talk "Comparison of effective continuum and dual-porosity approaches to thermal loading" by E. Kwicklis and G. Bodvarsson, CASY Symposium on Thermal Loading.

A presentation entitled "Modeling flow in unsaturated, fractured rock" by E. Kwicklis was made to DOE representatives, at a preliminary meeting conducted to coordinate presentations to the NWTRB in Reno, Nevada, April 21-22, 1993. Preparations for the presentation required numerous overheads be drafted or otherwise constructed by the speaker.

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

Summary Account Manager - G. Bodvarsson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUM009L Complete decoupled TOUGH testing

The decoupled TOUGH results agree well with results of the fully coupled TOUGH for a series of problems involving cross-sectional models from the 3-dimensional site-scale model.

Variances:

3GUM009L Revise study plan resolve comments

New planned finish date is June 25, 1993.

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

At the request of L. Hayes, G. Bodvarsson participated in a planning meeting for presentations to the Nuclear Waste Technical Review Board (NWTRB), to be held in Reno, Nevada, April 21-22, 1993. This scoping meeting was held in Las Vegas on March 22, 1993.

At the request of W. Dudley, G. Bodvarsson participated in a CASY meeting on the "Extended dry" concept. Bodvarsson served on a panel discussing the pros and cons of the "Extended dry" concept, as well as other related issues.

G. Bodvarsson spent considerable time during the month reviewing material concerning the "Extended dry" concept, preparing materials and viewgraphs for the NWTRB presentation and preparing viewgraphs for the IHLNW meeting in Las Vegas.

SCP 8.3.1.2.2.9.3L Simulation of the hydrogeologic system 0B33129C93

Summary Account Manager - G. Bodvarsson

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUM32L Complete report moisture flow

An outline of the moisture report has been completed and several chapters have been written. Several of the remaining chapters are being written or typed.

3GUM15L Collect/incorporate new data into moisture-flow model

Additional 2-dimensional simulations were conducted in order to evaluate the sensitivity of the results to the input data. Moisture tension data for the different units were reviewed and compared to values given to DOE by A. Flint.

Variances:

3GUM32L Complete report moisture flow

The completion of this report has been delayed due to unscheduled new work, including participation in the meeting on the "Extended dry" concept and preparation for the NWTRB meeting. The new finish date is May 31, 1993.

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

At the request of L. Hayes, G. Bodvarsson participated in a planning meeting for presentations to the Nuclear Waste Technical Review Board (NWTRB), to be held in Reno, Nevada, April 21-22, 1993. This scoping meeting was held in Las Vegas on March 22, 1993.

At the request of W. Dudley, G. Bodvarsson participated in a CASY meeting on the "Extended dry" concept. Bodvarsson served on a panel discussing the pros and cons of the "Extended dry" concept, as well as other related issues.

G. Bodvarsson spent considerable time during the month reviewing material concerning the "Extended dry" concept, preparing materials and viewgraphs for the NWTRB presentation and preparing viewgraphs for the IHLNW meeting in Las Vegas.

WBS 1.2.3.3.1.2.10 Prototype Hydrologic Tests that Support Multiple Site Characterization Activities

Principal Investigator - M. Chornack

OBJECTIVE

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

Prototype Cross-Hole Testing 0G3312AC93

Summary Account Manager - G. LeCain

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUT004 Prep open file report on ALTS testing & analysis

Work continued on the Apache Leap Test Site prototype testing open-file report. All statistical analysis of the air-permeability data has been completed and the author is presently working on the results sections.

Variances:

3GUT004M Final rpt, cross-hole Prototype testing

Since the author/PI has been required to dedicate a large amount of time to construction of the surface-based air-permeability testing equipment, the ALTS open-file report has not been completed.

Prototype Tracer Testing 0G3312AD93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUT016D Prepare WRI report on gaseous tracer tests

Calculated saturation point of gypsum cement with CO₂; revised table and graphs of CO₂ sorption onto gypsum cement.

Prototype Pore-Water Extraction 0G3312AG93

Summary Account Manager - A. Yang

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GUT050G Evaluate & analyze pore-water chemistry and compression techniques

Available cores were examined with respect to water content and potential to yield water from compression tests. Cores were selected for additional compression tests so that the remaining analyses required for this task may be completed.

Progress on this task has been slowed by the lack of personnel and the loss of P. Burger to the project. Burger did compression tests, handled the data base, and ran the pore-water chemical models. M. Beasley has been unable to devote much time to this task because of his work on the packer systems.

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

The writing of the OFR is in process. The report will include the data base of one dimensional pore-water extraction test results from first and second generation cell designs. The data tables for pre-testing information (sample, degree of welding, degree of saturation, water content, etc.), mechanical test data (load and volume of water extracted, strain, etc.), and pore-water chemistry data (ion concentrations, pH, etc.) have yet to be generated from the computer data files. C. Peters and J. Higgins have designed the tables and identified the appropriate data to be included. Peters is preparing an analysis of measurement precision/accuracy for the chemistry data to be included in the report. Higgins is preparing the text to accompany the tables.

C. Peters and J. Higgins began examining how the Lotus data files can be transferred into WordPerfect files so that tables can be prepared for the OFR.

Variances:

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

Preparation of the OFR is progressing slower than originally anticipated because of the lack of personnel to devote the required time to transfer the data files to the data tables for the report. The data clerk most familiar with the computer programs is no longer on the project. It is projected that completion of this task will be delayed until June 30, 1993.

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

Because of difficulties with the availability of rock saw equipment in the USBR labs during their building renovations, M. Beasley is converting a USGS rock saw to a dry cut saw to be used for core preparation. The conversion was completed this month. (5 hrs)

M. Beasley arranged for repair of one of the first generation one-dimensional compression cells. The sample sleeve was damaged during testing and must be machined clean of rough metal pieces attached to the sleeve. The work has been completed. (4 hrs)

J. Higgins made minor edits to WRIR on pore-water extraction after USGS editorial review. (1 hr)

WBS 1.2.3.3.1.3 Saturated Zone Hydrology

OBJECTIVE

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

WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-Water Flow System

Principal Investigator - M. Umari

OBJECTIVE

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

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

Summary Account Manager - R. Luckey

ACTIVITIES AND ACCOMPLISHMENTS

Support Project Operations

(A) Site Potentiometric-level Evaluation (8.3.1.2.3.1.2)

P. Tucci performed routine project operational tasks, including scheduling and coordinating field operations to maintain the water-level monitoring network, overseeing project budget items and spending, preparing personnel actions, attending section meetings, meeting with project personnel, and other miscellaneous administrative and operational tasks (not specified below) for the Site Potentiometric Levels project.

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

P. Tucci, D. Baldwin, T. Campbell, and R. Valentine attended GERT training. Tucci attended Procurement Integrity training on March 17, 1993.

P. Tucci finalized contractor work programs for work at wells USW H-5 and USW WT-7.

P. Tucci attended part of the CASY symposium, and attended the Performance Assessment meeting.

P. Tucci prepared site-potentiometric levels section for the semi-annual progress report.

D. Baldwin spent considerable time working on repairs to the multiconductor cable unit used to measure water levels. Time was also spent by several other project personnel in repairs and maintenance of steel tapes. New operating procedures for periodic maintenance of the steel tapes was initiated, and a purchase order for 2 new steel tapes was prepared.

(B) Saturated-zone Fractured-rock Hydrology (8.3.1.2.3.1.3)

M. Umari continued to discuss scheduling of c-holes testing activities with B. Sublette (SAIC/T&MSS); discussed electric power requirements for c-hole testing with D. Luckey, G. Patterson and J. Gemmell; prepared the monthly PACS report for February 1993; tracked spending under accounts 4889-12001, -12002, -12005, and -12006, and transferred \$33,200 to the USBR (from additional funding under -12006 that was not recognized at the beginning of FY93) to purchase 4 backup packers from Tam Inc.

Prepare Procurement Documents

Procurement paperwork was initiated to have a software engineering company write a computer program for the National Instruments Data Acquisition system, which will be used during the c-hole testing activities.

Do Operational Tasks

Work at the Raymond Quarry site, which will be used to prototype the c-holes-bound packer string. During March, LBL performed "site development" activities at Raymond. This included excavating trenches for laying of multi-conductor cables between well head and "office" trailer, placing a culvert for easy passage over surface drainage features, and leveling ground for placement of "office", and "storage" trailers. USGS personnel had to suspend their efforts aimed at diagnosing the electronic communication problem in one of two packer strings, while this "site development" activity was in progress.

Oversee LBL's Effort to Complete Analysis of Seismic Profile

D. Luckey had discussions with E. Majer of LBL regarding interpreting the results from the cross-hole tomographic survey done between wells UE-25 c#2, and UE-25 c#3. Agreement was reached that a geologist familiar with the c-holes should be sent to LBL to work with Majer during the interpretation. A. Geldon was selected to be the person.

Convert Scientific Notebook to Technical Procedure

The Scientific Notebook for the field simulation of the c-hole testing, which had been approved in February 1993, may have to be modified to reflect a slight change in temperature calibration requirement. The Scientific Notebook probably will be used for the initial stages of the actual testing at the c-holes (tests are planned to start in 7/93), and as such, the conversion to a technical procedure is not imminent.

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 requirements according to the ACSR YMP-USGS-ACS-G1233131-1, R0. The only exception is the program for automated data acquisition that is being contracted out to a software engineering design firm. This program will be entered into the software QA process upon receipt from the vendor.

Develop Scientific Notebook for (Hydraulic and) Tracer Tests

The scientific notebook for the field simulation of the c-hole testing was approved in February 1993. This scientific notebook 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 20 zones in 20 wells on a monthly basis (approximately 700 ft of steel tape are still stuck in well WT-7, above the water table, making it impossible to measure the water level in the well); monitored 17 zones in 12 wells on an hourly basis (for most of the month, the lower zone in well H-5 was unmonitored due to a packer jammed in the well); continuous analog data obtained from 3 zones in two wells (included in count of hourly sites above) in order to monitor water-level responses to earthquakes and UNE's; obtained real-time data on 17 zones in 12 wells using DCPs (included in count of hourly sites above); evaluated status of network at end of each month; and monitored real-time data on a daily basis, looking for water-level excursions and equipment malfunctions.

Special tasks completed in this reporting period: calibrated transducers at the following wells: G-2, WT-2, p #1, H-5 (upper zone), and H-6 (both zones); replaced transducers at wells G-2, and H-5; other equipment calibrated this month were data loggers and chart recorders in wells USW H-6 and UE-25p #1; water-level measurements were obtained in well UZ-16 on March 15, 18, 22, 25, and 29 (water levels appeared to be stable, at a depth of about 1,605 ft below the top of casing, after 3/15); work to free the packer stuck in well USW H-5 was completed by REECo on 3/25 (Transducers will be reinstalled as soon as additional equipment needed for the installation is acquired. Manual water-level measurements were made subsequent to reinstallation of the lower packer and access tubes. The access tube for the lower zone was severely corroded below the water table, and may have allowed hydraulic interaction with intervals above the lower packer. In addition, the lower packer did not appear to be properly seated, and also may have allowed hydraulic interaction with intervals above the packer);

Approximately 700 ft of steel tape from Chain #1 are still stuck in well USW WT-7; efforts to recover the remainder of the tape, by pulling out the access tubing, will begin in early April.

Reduce 1992 Transducer Calibrations

Work was done on selected calibrations for wells USW H-5, USW H-6, and UE-25p #1, for use in analysis of earthquake-induced water-level fluctuations.

SCP 8.3.1.2.3.1.2 Site potentiometric-level evaluation 0G33131B93

Summary Account Manager - P. Tucci

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GWF003D Reanalyze past c-hole data

A. Geldon, as part of writing the "Intraborehole flow & stress test" report, has been analyzing past c-hole test data by using manual graphical matching techniques. Some of the results will be incorporated in the milestone "Intraborehole flow and stress test report", P891. The present activity, 3GWF003D, should now be considered 100% complete.

3GWF010D Complete intraborehole flow & stress test report

A. Geldon has been working on the report, and continues to make very good progress. However, due to the large amount of data that he has had to process and analyze for this

report, the projected completion date of the report at this time is July 1, 1993 (date at which the report, having received colleague review, would be sent simultaneously for WRD Region/Head Quarters review, and for DOE concurrence).

3GWF08D Monitor/analyze strain-related pressure response
No progress. Awaiting placement of the multi-zone packer system in the c-holes, to conduct strain-related pressure monitoring during "down" times in the cross-hole testing.

3GWF064A Complete 1990-91 water-level report
Transducer data (1990-91) for all hourly monitored wells were converted to water levels for analysis and inclusion in the report.

Draft of "Data collection system" section of report is complete.

All tables and figures for "Periodic water-level measurements" section are complete. Tables for well specifications for "Hourly water-level measurements" section are complete.

Work on the periodic network data for the report is complete.

Continued revising and editing previous drafts of the report.

3GWF025A Reduce 1992 water-level data
Reduction of all 1992 periodic water-level data has been completed and checked.

Variances:

Work on the 1990-91 water-level data report still is behind schedule. Factors such as last year's delays in evaluation and reduction of the data (due to addressing effects of earthquakes on water levels and producing associated reports), recent problems of losing steel tapes in wells and jammed packers, writing criteria letters, getting data into ADAPS, and access problems in ADAPS, have all taken time away from work on the report. The report will be lengthy, because it includes 2 years of data for both the periodic and continuous networks, and colleague review of the report will also be lengthy. It is anticipated that an additional month will be required to complete the report. Anticipated completion date is May 30, 1993.

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

G. O'Brien attended and presented a poster at the Waste Management Conference, in Tucson, AZ. (32 hrs); supervised contractor work at well USW H-5 to remove a packer stuck in an access tube in the well and to reset the lower packer (80 hrs); worked on revisions to QMP 5.01. (16 hrs); worked on testing of new procedures for barometer operational checks and for using litmus paper instead of salt as an indicator of depth to water (8 hrs); and attended GERT training at NTC in Denver (2 hrs).

Status of approved reports or reports awaiting approval (not previously discussed): 1) the text of the approved report "Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1985-88" was submitted to the Colorado District for final formatting and processing. Work has begun on preparation of camera-ready copies of illustrations by the Colorado District; 2) the report, "Water levels in continuously monitored wells in the Yucca Mountain area, Nevada", by D. Lobmeyer and R. Luckey received USGS approval on March 26, 1993 (received DOE concurrence January 13, 1993); 3) the report, "Precision and accuracy of water-level measurements taken in the Yucca Mountain area, Nevada, 1988-90", by M. Boucher received USGS Director's approval as Water-Resources Investigations report 93-4025 on February 17, 1993 (received DOE concurrence January 13, 1993) and the report was sent to Colorado District for final processing for publication; and 5) the report, "Earthquake-induced water-level fluctuations at Yucca Mountain, June, 1992", by

G. O'Brien received USGS Director's approval on March 3, 1993 and the report was revised per review comments, and sent to Colorado District for final processing for publication.

SCP 8.3.1.2.3.1.3 Analysis of single- and multiple-well hydraulic-stress tests 0G3313'09'

Summary Account Manager - M. Umari

ACTIVITIES AND ACCOMPLISHMENTS

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 would also include instructions on assembly of the string prior to field deployment. The final review and revision process of these DM are not due to be completed until end of May 1993.

J. Bowen, USBR, prepared an outline for the DM package and presented it to M. Umari and J. Gemmell on February 18, 1993. During March, work continued on the outline, but USBR reported to Umari that there was difficulty devoting adequate time to the effort because of interruptions. It is the expectation of the SZFRHP that the USBR complete the DM on time according to the schedule in the TA signed on March 26, 1993, despite any interruptions.

3GWF030F Expand packer strings to 5-Zones

The work under this activity is being carried out jointly by the SZFRHP/HIP/USGS-YMP, and the USBR.

The TA between the USGS and the USBR, detailing what services the USBR is expected to provide in procurement and construction to expand the existing two 3-zone packer strings to three 5-zone packer strings, was signed on March 31, 1993.

During the week of March 15, 1993, J. Bowen, USBR and J. Earle (USGS) went to Houston, headquarters of Tam International Inc., to be present during testing of the 18 dual mandrel packers that the USGS is purchasing from Tam through the USBR. Some problems with the proper sealing of the bladder were identified and fixed during these tests. The packers were subsequently delivered to the USBR offices in Denver. After delivery, 1/4-inch diameter holes, drilled through the outer protective rubber down to the reinforcing steel bands of the packers, were noticed for the first time (drilled, apparently for equilibration of pressure on both sides of the protective rubber). These holes had been drilled after the final inspection in Houston; therefore, a letter has been requested from Tam documenting this change.

A local contractor (Cable Tech) had been identified to do the soldering of wires between water-proof electric connectors and multi-conductor cable segments. This is work that the USBR was initially slated to do, but due to funding problems, was removed from their scope of work. Problems with the soldered connections produced by Cable Tech were detected by conducting electric-continuity checks. J. Gemmell met with representatives of the company and explained that any problems with the soldering can not be tolerated. The problem connections were re-soldered, and quality of work improved substantially on the subsequent batch of soldered connections.

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

Using the USGS HST (Heat and Solute Transport) 3-D code, written by K. Kipp, USGS/WRD NRP, to develop a 3-dimensional porous-medium-equivalent model of the c-

hole complex (the model can be used for cross-hole test design, and analysis of the eventual cross-hole test results): On March 18, 1993, M. Umari met with K. Kipp to discuss problems that the USGS/WRD San Diego Project Office had experienced in attempting to use HST. One of the problems was the slow speed of execution of the code on a DG workstation. This may not be a problem for us, because the grid being considered has 510 elements, versus 24,500 elements for the San Diego grid. Umari and G. Patterson started designing a 2-dimensional cross-sectional grid between c1 and c3 that would implement a very simplified representation of the geology, for a first approximation. This 2-dimensional approach substantially reduces the computer storage and memory needs, and allows for use of the USGS SUTRA (Saturated, Unsaturated, Transport) code, in case difficulties are encountered in using the HST code.

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): E. Ervin is doing this work in cooperation with the SZFRHP. Much effort was spent trying to reprogram funds to the M&O, through which Golder Associates will be contracted.

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

J. Gemmell had telephone discussions with W. Soto (RSN) regarding generated power requirements. The critical factor is how long the pump can be non-operational during an active cross-hole hydraulic or tracer test. An attempt is being made to comply with the request of having the "down time" be as close to zero as possible, without driving up the cost of providing such performance to exorbitant levels. The factors affecting duration of pump "down time" are the duration of power outage and the length of time it takes to return the multi-stage pump to full operation.

J. Gemmell had telephone discussions with E. Wasson (RSN) regarding the issue of manipulation of the pump and pump shroud during installation at the c-holes. The pump/shroud unit (which is 75-ft long when fully assembled), can be either assembled on the ground and then lifted by a drill rig or crane, or built from-the-bottom-up as it is installed in the hole.

J. Earle and J. Darnell attended the class "Basic Electronics and Trouble-Shooting of Hydrologic Instrumentation" at the Hydrologic Instrumentation Facility (HIF) in Mississippi during the week of March 8, 1993.

SCP 8.3.1.2.3.1.4 Multiple-well interference testing 0G33131D93
Summary Account Manager - M. Umari

ACTIVITIES AND ACCOMPLISHMENTS

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 would also include instructions on assembly of the string prior to field deployment. The final review and revision process of these DM are not due to be completed until end of May 1993.

J. Bowen, USBR, prepared an outline for the DM package and presented it to M. Umari and J. Gemmell on February 18, 1993. During March, he continued to work on it, but reported to M. Umari that he is experiencing difficulty devoting adequate time to the effort because of interruptions. It is the expectation of the SZFRHP that the USBR complete the DM on time

according to the schedule in the TA signed on March 26, 1993, despite any interruptions.

3GWF030F Expand packer strings to 5-zones

The work under this activity is being carried out jointly by the SZFRHP/HIP/USGS-YMP, and the USBR.

The TA between the USGS and the USBR, detailing what services the USBR is expected to provide in procurement and construction to expand the existing two 3-zone packer strings to three 5-zone packer strings, was signed on March 31, 1993.

During the week of March 15, 1993, J. Bowen (USBR) and J. Earle (USGS) went to Houston, headquarters of Tam International Inc., to be present during testing of the 18 dual mandrel packers that the USGS is purchasing from Tam through the USBR. Some problems with the proper sealing of the bladder were identified and fixed during these tests. The packers were subsequently delivered to the USBR offices in Denver. After delivery, 1/4-inch diameter holes, drilled through the outer protective rubber down to the reinforcing steel bands of the packers, were noticed for the first time (drilled, apparently for equilibration of pressure on both sides of the protective rubber). These holes had been drilled after the final inspection in Houston; therefore, a letter has been requested from Tam documenting this change.

A local contractor (Cable Tech) had been identified to do the soldering of wires between water-proof electric connectors and multi-conductor cable segments. This is work that the USBR was initially slated to do, but due to funding problems, was removed from their scope of work. Problems with the soldered connections produced by Cable Tech were detected by conducting electric-continuity checks. J. Gemmell met with representatives of the company and explained that any problems with the soldering can not be tolerated. The problem connections were re-soldered, and quality of work improved substantially on the subsequent batch of soldered connections.

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

Using the USGS HST (heat and solute transport) 3-D code, written by K. Kipp, USGS/WRD National Research Program, to develop a 3-dimensional porous-medium-equivalent model of the c-hole complex (the model can be used for cross-hole test design, and analysis of the eventual cross-hole test results): M. Umari met with Kipp to discuss problems that the USGS/WRD San Diego Project Office had experienced in attempting to use HST. One of the problems was the slow speed of execution of the code on a DG workstation. This may not be a problem, because the grid being considered has 510 elements, versus 24,500 elements for the San Diego grid. Umari and G. Patterson started designing a 2-dimensional cross-sectional grid between c1 and c3 that would implement a very simplified representation of the geology, for a first approximation. This 2-dimensional approach substantially reduces the computer storage and memory needs, and allows for use of the USGS SUTRA (saturated, unsaturated, transport) code, in case difficulties are encountered in using the HST code.

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): E. Ervin is doing this work in cooperation with the SZFRHP. Much effort was spent trying to reprogram funds to the M&O, through which Golder Associates will be contracted.

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

J. Gemmell had telephone discussions with W. Soto (RSN) regarding generated power requirements.

The critical factor is how long can we tolerate the pump to be non-operational during an active cross-hole hydraulic or tracer test. The USGS is attempting to stick to the request of having this "down time" be as close to zero as possible, without driving up the cost of providing such performance to exorbitant levels. The factors affecting duration of pump "down time" are the duration of power outage and the length of time it takes to return the multi-stage pump to full operation.

J. Gemmell had telephone discussions with E. Wasson (RSN) regarding manipulation of the pump and pump shroud during installation at the c-holes. The pump/shroud unit (which is 75-foot long when fully assembled), can be either assembled on the ground and then lifted by a drill rig or crane, or built from-the-bottom-up as it is installed in the hole.

J. Earle and J. Darnell attended the class "*Basic Electronics and Trouble-Shooting of Hydrologic Instrumentation*" at the Hydrologic Instrumentation Facility in Mississippi during the week of March 8, 1993.

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

Summary Account Manager - M. Umari

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

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 has 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 1, 1993 to September 30, 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.

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

The following two bullets are repeats of bullets presented under the monthly report for Summary Account number 8.3.1.2.3.1.4, because the two computer modeling activities discussed in the bullets serve activities under accounts 8312314 and 8312315 (the present account) at the same time:

Using the USGS HST (Heat and Solute Transport) 3-D code, written by Ken Kipp, USGS/WRD National Research Program, to develop a 3-dimensional porous-medium-equivalent model of the c-hole complex (the model can be used for tracer test design and for analysis of the eventual tracer test results): On 3/18/1993, M. Umari met with Ken Kipp to discuss problems that the USGS/WRD San Diego Project Office had experienced in attempting to use HST. One of the problems was the slow speed of execution of the code on a DG Work Station. This may not be a problem, because the grid being considered has 510 elements, versus 24,500 elements for the San Diego grid. M. Umari and G. Patterson started designing a 2-dimensional cross-sectional grid between c1 and c3 that would implement a very simplified representation of the geology, for a first approximation. This 2-dimensional approach substantially reduces the computer storage and memory needs, and allows for use of the USGS SUTRA (Saturated, Unsaturated, Transport) code, in

case difficulties are encountered in using the HST code (T).

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): E. Ervin is doing this work in cooperation with the SZFRHP. Much effort was spent trying to reprogram funds to the M&O, through which Golder Associates will be contracted.

Variations:

3GWF170A Complete tracer injection system

The completion date for the construction of the tank has been delayed from April 1, 1993 to September 30, 1993. This will not have any negative impact because the tracer tests, for which the tank will be used, will not begin until October 1, 1994. This delay will give the SZFRHP members time to interact with the Isotope Geology machine shop, and develop detailed plans for the construction of the tank.

WBS 1.2.3.3.1.3.2 Saturated Zone Hydrochemistry

Principal Investigator - W. Steinkampf

OBJECTIVE

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

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

Summary Account Manager - W. Steinkampf

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GWH001A Assessment of extant data, phase II

Transfer of the SAS package from the Sun to the Data General resulted in difficulties in use that persisted for several days before computer-support staff was available to institute corrective action. Lithologic data was retrieved from ARC/INFO and combined with the lithologic information in the edited database. The records were sorted by lithology, then basic statistics for major cation and anion concentrations within each lithologic group were calculated using SAS. For preliminary comparison, the results have been plotted using LOTUS. Preliminary Piper plots of major cation and anion concentrations have been made. In addition, data for twenty-three minor elements have been plotted and contoured for the regional area.

Planning and Operations:

3GWH001A Assessment of extant data, phase II

B. Steinkampf met with D. Perfect, K. Turner, and G. Closs (Colorado School of Mines) to discuss the basis for future statistical examinations of the large data sets

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

D. Perfect attended the USGS CASY workshop examining effects of extended-dry repository simulations, as presented by T. Buscheck (LLNL). (18 hrs.)

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:

3GWH004B Collect hydrochemical data/samples

B. Steinkampf met with J. Woolverton, K. Casseaux, M. Whitfield, and D. Appel to discuss possible quality problems inherent in initial ground-water sample collection at UE25 UZ-16. Discussions with management and quality staffs, and examination of field records, revealed that there were no quality concerns relative to these sample-collection efforts.

3GWH005B Develop borehole data/sample collection methods

B. Steinkampf attended a presentation of colloid sampling techniques, and subsequent quantification and qualification methods by C. Degueudre (P. Scherrer Inst./NAC' A). Discussions ensued from questions posed by YMP investigators from LANL, LLNL, and the USGS. During a subsequent field trip to the NTS, Steinkampf discussed further with Degueudre YMP plans for hydrochemical characterization. Degueudre's comments and recommendations will be discussed with other geochemistry PIs within the project and incorporated as appropriate. Communication with Degueudre will be maintained relative to colloid methods.

3GWH006B Develop mobile lab and downhole collection equipment

B. Steinkampf transmitted written concerns to L. Hayes regarding the impacts of past, and possible future, delays of funding for sample- and data-collection equipment on project schedules and the likely quality of data that could derive from use of alternative methods.

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

B. Steinkampf participated in a YMP/Geochemical Integration Team meeting to formulate plans for studies designated as needed to address post-emplacement geochemical aspects of coupled geochemical/hydrological processes that likely will occur as a result of the perturbation of the thermal and geohydrologic regimes at and in the vicinity of the repository block.

B. Steinkampf attended the USGS CASY workshop examining effects of extended-dry repository simulations, as presented by T. Buscheck (LLNL). (26 hrs)

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 met with Death Valley National Monument (DVNM) personnel to ensure future access to a closed area at the north end of the monument. Access to the area will be coordinated with DVNM natural-resources and protection staffs.

3GWH910 Collect/analyze/evaluate regional samples - FY93

B. Steinkampf, together with K. Stetzenbach (UNLV Harry Reid Center for Environmental Studies) and UNLV students, and B. Newman (New Mexico Tech/LANL) collected water samples and field hydrochemical data at six sites in DVNM.

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

An estimated 20 hours were spent in support of the following tasks:

B. Steinkampf participated in a teleconference meeting of the ASME NQA sub-committee for nuclear waste management (SCNWM), and began preparation of material in support of a task (NQA-3 revision/expansion) proposed by the SCNWM to the ASME Main Committee.

B. Steinkampf provided guidance to J. Czarnecki regarding analytical suites for surface- and ground-water samples to be collected by the regional saturated-zone study.

B. Steinkampf responded to a request for re-consideration of his dissenting ballot on the proposed American National Standard ANSI/ASQC EA, *Quality Systems Requirements for Environmental Programs*. Re-examination of comments on and concerns about the draft document resulted in re-affirmation of disapproval.

B. Steinkampf participated in an interactive workshop, the objectives of which were to identify extant and planned performance-assessment data needs, to enable performance-assessment modelers to better understand the nature of geohydrologic site-characterization data that is and will be collected, and to initiate/improve dialogues between USGS investigators and the modelers.

WBS 1.2.3.3.1.3.3 Saturated Zone Hydrologic System Synthesis and Modeling

Principal Investigator - E. Ervin

LBL Principal Investigator - K. Karasaki

OBJECTIVE

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

SCP 8.3.1.2.3.3.1 Conceptualization of saturated zone flow models within the boundaries of the accessible environment 0G33133A93

Summary Account Manager - E. Ervin

ACTIVITIES AND ACCOMPLISHMENTS

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

An estimated 25 hours were spent in support of the following tasks:

The report entitled "Revised potentiometric-surface map for Yucca Mountain and vicinity, Nevada", by E. Ervin, R. Luckey and D. Burkhardt received approval after a programmatic and policy review from the DOE. The text of the report is in final camera-ready format; the figures are being drafted by the Publications and Graphics Units of the USGS Colorado District.

E. Ervin attended a Performance Assessment meeting sponsored by DOE for the purpose of technical data exchange among the investigators collecting the data and performance assessment modelers. Interest by several parties was expressed in Ervin and others' revised potentiometric-surface map. A copy of the map in page size format, which will be published as part of the ANS International High Level Nuclear Waste Conference, was provided to interested parties by R. Luckey.

E. Ervin prepared slides and worked on the presentation, 'Summary of revised potentiometric-surface map, Yucca Mountain and vicinity, Nevada' for the International High-Level Nuclear Waste Conference.

SCP 8.3.1.2.3.3.2 Development of fracture network model 0G33133B93

Summary Account Manager - E. Ervin

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GWM013B Complete fracture mapping/prep rpt: Crater Flat

E. Ervin completed entering the fracture data, collected from outcrops east of Little Skull Mountain and Raven Canyon in the Bullfrog Member of the Crater Flat Tuff, into a LOTUS data base in preparation for a report (Milestone 3GWM013M). Significant progress was made on the text of the report and related illustrations.

M. Chornack completed fracture-line surveys at Raven Canyon in the Bullfrog Member of the Crater Flat Tuff.

3GWM005B Develop conceptual model fracture network FY93

Much effort was spent by E. Ervin trying to assist in the reprogramming of funds to the M&O, through which Golden and Associates, who developed FracMan, will be contracted. This effort was successful thanks to many people including L. Hayes, D. Gilles, and R. Ritchey. The purpose of this work is to assist in the placement of the packers during C-hole cross-hole testing.

Quality Assurance:

3GWM013B Complete fracture mapping/prep rpt: Crater Flat

L. Anna of the UZ section, fractured rock hydrology project, finished his independent review of the fracture data collected by E. Ervin and M. Chornack and found the data to be accurate with the exception of a couple of minor transcription errors. These errors were corrected.

SCP 8.3.1.2.3.3.2L Development of fracture network model 0B33133B93

Summary Account Manager - K. Karasaki

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GWM18CA Study outcrop fracture bias and prepare report

An algorithm to simulate 2-dimensional gaussian random fields with a known, exponentially decaying covariance function was written and is now being implemented. The method implemented is the turning bands method using spectral methods for generating the underlying line/bands process.

3GWM21CA Complete TRINET users' manual

A fracture flow simulation was successfully carried out using TRINET with 250,000 elements on a Sun workstation. This is the largest simulation ever run using TRINET.

3GWM23CA Study prediction error and design test

A paper titled "An inverse technique for developing models for fluid flow in fracture systems using simulated annealing", by A. Davey-Mauldon, et al. has been accepted for publication in *Water Resource Research*.

A case study was started to test an inversion algorithm that iterates on clusters of fractures and variable apertures.

WBS 1.2.3.6 Climatology and Meteorology

OBJECTIVE

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

WBS 1.2.3.6.2 Climatology

OBJECTIVE

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

WBS 1.2.3.6.2.1 Change in Climatic Conditions

OBJECTIVE

To provide a baseline for determining the changes in climate that potentially affect the waste isolation capabilities of the site. (SCP Investigation 8.3.1.5.1)

WBS 1.2.3.6.2.1.1 Modern Regional Climate

Principal Investigator - B. Parks

OBJECTIVE

To develop a synoptic characterization of the modern regional climate to provide a baseline and a background for the interpretation of climatic variation. (SCP Study 8.3.1.5.1.1)

SCP 8.3.1.5.1.1.1 Synoptic characterization of regional climate 0G36211A93

Summary Account Manager - R. Forester

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GCR005B Develop study plan
Study Plan is still in USGS review.

3GCR014 Conduct stable/radiogenic isotope analysis of precipitation
B. Widmann completed chemistry on samples of precipitation collected at Yucca Mountain during December.

S. Mahan analyzed these samples for Sr isotopic compositions. Four samples collected from different sites yielded a range of $^{87}\text{Sr}/^{86}\text{Sr}$ values from 0.70933 to 0.71059. However, the Sr content of rainwater is extremely low and the isotopic composition will be strongly influenced by the incorporation of any solids (e.g. dust).

Variations in observed data suggest that further studies may reveal consistent geographic patterns of dust dispersal.

Variances:

3GCR005B Develop study plan
Completion of Study Plan has been delayed due to field work and leave taken by key personnel.

WBS 1.2.3.6.2.1.2 Paleoclimate Study of Lake, Playa, and Marsh Deposits
Principal Investigator - B. Parks

OBJECTIVE

To establish the nature, timing duration, and amplitude of paleoclimate changes based on paleontologic, stratigraphic-sedimentologic, chemical, and mineralogic analyses of lacustrine sediments in or near southern Nevada; and provide a chronologic frame work for this paleoclimatic information. (SCP Study 8.3.1.5.1.2)

SCP 8.3.1.5.1.2 Paleoclimate study of lakes, playas, and marshes LOE Account 0G36212Z93
Summary Account Manager - B. Parks

ACTIVITIES AND ACCOMPLISHMENTS

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

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GCL013B Collect cores

Plans to collect cores continue to be delayed because of the above normal rainfall in the region, making it impossible to access some of the dry lakes and playas that will be cored. The major coring activity originally scheduled to begin in February, 1993 tentatively has been rescheduled to begin in mid April 1993.

3GCL016B Paleontological preparation/assessment

Ostracode and chemical data from 88 sites was entered into the modern data base that will serve as the basis for analog reconstruction of climate parameters. The data base now contains 244 entries. This data base provides the basis to reconstruct past climate and hydrological parameters from various sites in southern Nevada as well as validate the SNL/NCAR past climate modeling efforts.

3GCLO14B Stratigraphic analysis

Summary of findings from field trip taken in January has been completed. Review continues in the USGS. This document will satisfy the stratigraphic analysis described in this work element.

Variances:

R. Forester participated in DOE organizational meeting for forthcoming NWTRB presentation on modeling future infiltration.

R. Forester prepared an extended abstract titled "Temporal changes in lacustrine chemistry, a measure of perturbations in the hydrological cycle" with A. Smith. This abstract is for a keynote address. Forester will present at the sixth international Paleolimnology meetings in Canberra, Australia on April 21, 1993.

R. Forester made a preliminary reconstruction of the chemical-climate linkage for the last pluvial cycle in the Great Salt Lake, the Bonneville Cycle. The history and timing of that lake level rise and fall appears to provide a good indicator of climate change in southern Nevada.

WBS 1.2.3.6.2.1.3 Climatic Implications of Terrestrial Paleocology

Principal Investigator - B. Parks

OBJECTIVE

To determine aspects of past vegetation change; and use vegetation records to provide quantitative estimates of changes in climatic variables for the southern Great Basin. (SCP Study 8.3.1.5.1.3)

SCP 8.3.1.5.1.3.1 Analysis of pack rat middens 0G36213A93

Summary Account Manager - P. Wigand

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GCL110 Management oversight/scientific coordination

Because of the delay in field work due to the excessive rainfall in southern Nevada during the past several months, the DRJ was unable to collect the pack rat midden material they expected to collect.

WBS 1.2.3.6.2.1.4 Paleoenvironmental History of Yucca Mountain

Principal Investigator - B. Parks

OBJECTIVE

To evaluate the paleoenvironmental record at Yucca Mountain and surroundings in light of inferred paleoclimate history of the southern Great Basin; to model soil properties in the Yucca Mountain region; to map surficial deposits; and to reconstruct the eolian history of the region. (SCP Study 8.3.1.5.1.4)

SCP 8.3.1.5.1.4.2 Surficial deposits mapping of Yucca Mountain area 0G36214B93

Summary Account Manager - S. Lundstrom

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GCH039A Prepare report/on FY/92 study

The PI drafted this report in January, 1993. and it currently is in USGS review.

3GCH035A Airphoto/fieldcheck/sampling/analysis n. 1/3 YM.

Continued airphoto interpretation and field checking of deposits. Analyses are being entered onto map products. A review of S. Lundstrom's field work and mapping activities was carried out by USGS YMPB senior staff.

3GCH040A Isotopic analysis

K. Futa started a search of the geochemical and tephrochronology literature to compile a data base of Sr isotopic compositions of Quaternary ignimbrites and ashfalls from the western U.S. These data will be used to interpret the source, and hence, the age, of glassy ash deposits collected by S. Lundstrom from Yucca Wash.

SCP 8.3.1.5.1.4.3 Eolian history of the Yucca Mountain region 0G36214C93

Summary Account Manager - J. Whitney

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GCH163C Collect samples for isotopic analysis

K. Futa prepared 20 samples of fine-grained playa deposits from the northern NTS and northern Death Valley for Sr isotope chemistry. Samples were leached with 1N HCl, and the residues dried and weighed to determine the approximate amount of insoluble residue.

WBS 1.2.3.6.2.2 Effects of Future Climatic Conditions on Hydrologic Characteristics

OBJECTIVE

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

WBS 1.2.3.6.2.2.1 Quaternary Regional Hydrology

Principal Investigator - R. Luckey

OBJECTIVE

To investigate the hydraulic characteristics of paleoflood events and to compare them with modern flooding and related geomorphic processes; to determine past infiltration and percolation history at Yucca Mountain through isotopic and chemical analysis of water from the unsaturated zone; to determine past hydrologic conditions in the regional discharge area; to estimate the conditions and rates of infiltration and ground-water recharge during the Quaternary; and to determine the ages, distribution, origin, and paleohydrologic significance of calcite and opaline silica deposits along faults and fractures. (SCP Study 8.3.1.5.2.1)

SCP 8.3.1.5.2.1 Quaternary regional hydrology LOE Account 0G36221Z93

Summary Account Manager - R. Luckey

ACTIVITIES AND ACCOMPLISHMENTS

Collect Hydrologic Data FY93

Continue data collection at the Stewart Creek and Kawich Creek Analog Recharge sites. The data collection system consists of 2 stream-flow sites, 4 meteorological sites, and 6-8 water quality sites. On a daily basis, T. Oliver checks the NWIS data base for DCP data and performs weekly data pulls from the LRGS to fill missing data.

In addition: T. Oliver prepared annual summaries for the 1992 WY data; updated the weather data statistics for the analog sites to include the 1992 WY; and estimated a period of missing record at the Veg Spring weather site using data regression from weather stations in Nevada.

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.

In addition: E. Gutentag planned a field collection trip to Nellis Air Force Base Bombing Range to be conducted in late April. He held talks with the captain in charge of the bombing range to coordinate sampling and access issues. Due to access restrictions on the Nellis Bombing Range, a waiver request for certain YMP requirements for Air Force personnel was submitted to the TPO and QA Manager as these personnel are requested to assist in sampling at Groom and Papoose Lakes.

Ed Gutentag also attended the following meetings, training, talks, etc.: CASY Symposium

on March 24 and 25; Performance Assessment meeting on March 26; the "Isaac Winograd Mendenhall" talk on March 26; and GERT training on March 30.

During the reporting period, the QA Specialists involved in this study monitored all project activities for QA compliance, tracked all open items, and attended bi-weekly USGS-HIP SZ QA meetings.

Other Special Tasks and Items Included

USGS-NCR-93-09: The response including remedial actions and actions to prevent recurrence was submitted to the QA Office to address deficiencies in review and approval documentation for a scientific report prepared and written by GSP personnel. As such, HIPs, and specifically J. Watson's, role in addressing this issue as assigned co-dispositioner, will be limited. P. Reilly will be the primary QA person handling this NCR in the future.

USGS-NCR-93-12 has been issued for SP Activity 8.3.1.5.2.1.4b addressing the issue of a requisition request not being prepared for the purchase of calibration services for 21X Data Loggers. M. Ciesnik has been assigned disposition responsibility.

USGS-AFR-92-07: The contract with the New Mexico Institute of Mining and Technology (NMIT) for Activity 8.3.1.5.2.1.4b is being modified as part of actions to be completed for this AFR. This action is based on changed QA requirements for the activity as reflected in a submitted ACSR. The contract is being modified by administrative personnel.

J. Watson attended the following meetings, training, talks, etc.: Foothill Engineering meeting; question/answer session on the new revision of QMP-5.05; QA Open Items meeting; CASY Symposium; YMP-Nevada Operations meeting; and GERT training.

SCP 8.3.1.5.2.1.1 Regional paleoflood evaluation 0G36221A93

Summary Account Manager - D. Grasso

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GQH010A Prepare prelim summary of YM paleoflood studies

D. Grasso began reducing modern flood data from the WATSTOR data base and precipitation data from NOAA weather stations in the Amargosa Desert and Yucca Mountain regions. These data ultimately will be used in tables and graphs for the preliminary summary of the Yucca Mountain paleoflood studies. Graphical presentations also will be prepared from these data to show quantitatively modern precipitation-runoff conditions in the region and to depict potential paleoflood scenarios for drainages in the vicinity of Yucca Mountain. In addition to data preparation activities, a working outline for the preliminary summary report was prepared. The report will (1) describe the results of geomorphometric analysis and field reconnaissance activities, (2) summarize modern-day and paleoflood runoff conditions in the region, (3) postulate boundary conditions for likely paleoflood conditions, and (4) show those aspects of the study where more detailed site-specific work is needed.

SCP 8.3.1.5.2.1.3 Evaluation of past discharge areas 0G36221C93

Summary Account Manager - E. Gutentag

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GQH003 Vegetation mapping Phase II

F. D'Agnesse finalized preliminary vegetation maps and worked on report for Regional Vegetation Mapping Death Valley Region. A field trip is scheduled for April 21 - May 3, 1993 to check resulting density and land cover classes. A final map and report are projected for summer.

K. Turner continued to complete draft report on the Amargosa Desert vegetation mapping originally conducted by L. DeMarco. Report essentially is complete and will be submitted for colleague review next month.

3GQH11 Complete report on methods of channel geometry

W. Osterkamp revised the report to incorporate reviewers comments and sent it to the YMPB-HIP editor. Author considers the report ready for processing by YMPB.

3GQH019 Prepare report on origins of surface deposits

First preliminary report for this study, on the distribution of pedogenic carbonates, was returned from technical review. The results from this study will be compared with results from vegetation and chemistry studies. Results from this analysis will be incorporated into report to be completed at end of fiscal year. No additional work was done on this report.

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

In early March a field trip was conducted where 6 sites were collected for complete water analysis, faunal analysis and $^{87}\text{Sr}/^{86}\text{Sr}$ ratios. One site was from a spring along the Virgin River in Utah. Samples were collected from Resting Springs, Willow Springs (China Ranch), Chappo Spring near Tecopa, and Sullivan Spring in the Bull Frog Hills near Beatty. A well was sampled for water level, water chemistry, and Sr ratios in the California Valley near Tule Spring. In addition, Saratoga Springs and Triangle Spring in Death Valley National Monument were collected for ostracodes and $^{87}\text{Sr}/^{86}\text{Sr}$ ratios. Eight samples were collected from wells in the town of Amargosa Valley for $^{87}\text{Sr}/^{86}\text{Sr}$ ratios. One well in the southern Pahrump Valley, and two small springs in Death Valley National Monument were sampled for $^{87}\text{Sr}/^{86}\text{Sr}$ ratios.

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

Water samples collected in early March were submitted for analysis at the NWQL. Nutrient analyses were received for the water samples collected in 3GQH021.

B. Widmann and S. Mahan completed Sr isotopic analyses of spring waters collected from the northwestern Spring Mountains (Grapevine, Diebert and Kwitchip springs). $^{87}\text{Sr}/^{86}\text{Sr}$ ratios range from 0.7330 to 0.7369 reflecting Sr equilibration with metasediments of Precambrian age composing this portion of the local aquifer.

These waters may provide the source for the high $^{87}\text{Sr}/^{86}\text{Sr}$ end member for mixed waters discharging from the southeastern-most springs at Ash Meadows (e.g. Last Chance, Bole, and Big springs) and represent further evidence for the utility of Sr isotopic compositions for tracing ground-water flow paths.

S. Mahan, along with E. Gutentag, C. Faunt, and F. D'Agnesse, spent a week in Nevada and California collecting waters from the northern Mojave Desert, Amargosa Farms area, Bullfrog Hills and southern Death Valley. These samples of well and spring waters will fill important gaps in the Sr and U isotopic data base of the Yucca Mountain region.

K. Futa continued analyses of multiple aliquots of two carbonate samples from fine-grained paludal deposits in the Pahrump Valley. Earlier preparations typically did not provide adequate yields for alpha-counting, so chemistry was repeated on additional aliquots to attain better results. Preliminary data from a tufa horizon within a stratigraphic section studied in detail by J. Quade (U. Arizona) result in an age of 9.4 ka. This section has received rigorous ^{14}C geochronological attention and ranges in age from 11.2 to 8.4 ka. Although the tufa horizon has not been dated previously, its position within the section probably corresponds to an age of between 9 and 10 ka. If these results are confirmed with additional data, they will add analytical confidence to the U-series geochronological technique performed on similar carbonates from the southern Great Basin.

J. Paces completed U-Th chemistry on four aliquots from two samples of spring discharge carbonate from Site 199 and the Horsetooth Locality. Samples are currently counting on the alpha spectrometer. These samples will better constrain the preliminary results from the deepest analyzed sample at Site 199 (HD659) and the single leach/residue pair used to estimate the age of the Horsetooth deposit. In addition, previous U-series results from Site 199 were re-examined using realistic estimates of the correlation of errors between isotope ratios on isochron plots. Ages and associated errors are similar to those reported previously which were calculated without considering the effects of error correlations.

B. Widmann completed Sr chemistry on water samples Fortymile Wash runoff waters collected by C. Savard.

Samples will be run for Sr isotopic composition next month.

3GQH037 Determine Discharge Mechanism in Hydrologic Units

Report outline on present regional discharge was reviewed by E. Gutentag, C. Faunt, and F. D'Agnese.

A plot of hydrochemical data and flow paths was examined to help with hypothesis testing of ground-water flow system.

F. D'Agnese conducted analysis of present-day discharge areas. Areas are being mapped for 3D model arrays. Areas include discharge from free-water, bare soils, wetlands/marshes, and phreatophyte areas. Comparisons were made with historical estimates by Rush, Harril, Maxey and Eakin, Malmberg, etc. Also comparisons were made with published models.

F. D'Agnese continued analysis of regional spring discharge. This included analyzing spring discharge, temperature and chemistry to determine if spring discharge was, indeed, a regional discharge component. Additional spring localities along the Amargosa River and at Carson Slough have been located. This activity will help direct future sampling trips for faunal, isotope and chemical characterization of ground-water in area, as well as offer insight into spring fluxes in regional 3D modeling.

Planning and Operations:

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

F. D'Agnese, C. Faunt, and E. Gutentag planned an April field trip to Nevada for water samples, playa samples and to check vegetation. Part of the trip is to collect samples on the Nellis Air Force base, after the collectors attend Air Force Ordnance Disposal training. On April 24-25, Desert Lake, Tikaboo Playa, Dog Bone Lake, Three Lakes, Indian Springs Playa, and North Indian Springs Playa, and Fort Springs in the Pinwater Range will be sampled. On May 1 and 2, Gold Flat, Kawich Playa and other sites will be sampled.

Variances:

3GQ111 Complete report on methods of channel geometry

The report is delayed by about 7 days and T. Brady will send it to DOE on April 8 and to USGS Headquarters on April 9.

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

Time was spent attending the Performance Assessment (8 hrs) and CASY meetings (16 hrs).

SCP 8.3.1.5.2.1.4a Analog recharge sites 0G36221D93

Summary Account Manager - R. Lichty

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GQH12CA prepare data reports FY92

T. Oliver estimated a period of missing weather record at the Veg Spring weather site using data regression to weather stations in Nevada.

T. Oliver gave P. McKinley the surface water records for Kawich and Stewart basins for review.

T. Oliver developed tables for the FY92 meteorological and water-quality data. Surface water discharge tables will be developed after the review of this data is complete.

3GQH14CA Test PRMS model

B. Lichty investigated the impact of incorporating extensive data on snow pack water contents, from the April 1992 snow surveys in Stewart Creek watershed, on the PRMS model estimates of water balance components, and to assess the apparent winter season catch efficiencies of the two recording precipitation gages. Apparent catch efficiencies of about seventy-five percent are indicated, which translates to winter season precipitation adjustment factors of about 1.3 times gaged estimates of snowfall water equivalents. Use of adjusted water equivalents in years prior to the 1992 water year resulted in minor changes in estimates of components of stream flow. However, computed estimates of annual water loss due to evapotranspiration and snowpack ablation increase by about twenty percent.

SCP 8.3.1.5.2.1.4b Geochemistry of arid-zone infiltration 0G36221E93

Summary Account Manager - A. Riggs

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GQH001D Prepare long-term meteorological data report

The figures, data tables, and most of the text were completed.

3GQH003D Collect watershed inputs and meteorological data

Meteorological data collection continued uninterrupted through March. Calculation of the slopes and offsets of the newly calibrated tower instrumentation was performed; the 15 MCS6000 soil moisture probe systems were assembled and arrangements for calibration of the probes were made; and the data logger program was written.

The enclosures, solar panels, wiring and hardware needed to set up the soil monitoring systems were purchased.

3GQH007D Analyze/interpret CL-36 and precipitation data

Five caliche profile samples were measured for total Cl content by the teflon diffusion cell method.

Quality Assurance:

3GQH003D Collect watershed inputs and meteorological data

The meteorological tower instrumentation scientific notebook was closed out.

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

Approximately 26 hours were spent in support of the following tasks:

CASY hot/cold repository meeting; closeout review of three of McKinley's scientific notebooks;

GERT; reviewed draft of USGS diving policy statement.

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

Summary Account Manager - J. Whelan

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GQH816B Collect specimens from cores and field sites

T. McConnaughey, J. Whelan, and R. Moscati spent 12 days at and around the NTS measuring concentrations of soil gas CO₂ and collecting soil profiles and soil gas profiles for measurement of the stable isotopic compositions of H₂O and CO₂. Permanent soil gas sampling probe arrays were emplaced at Fran Ridge, Exile Hill, Forty Mile Wash, Pagany Wash, the southern flank of Rainier Mesa, and at the US Ecology low-level waste disposal site near Beatty. Approximately two hundred and fifty samples of soil, soil gases, and soil carbonate were collected during this trip.

J. Whelan received samples of precipitation in the Yucca Mountain area collected by D. Ambos. These samples are collected after each precipitation event and represent the beginning of monitoring of stable isotope variations of local and regional precipitation in support of 8.3.1.5.1.1, "Characterization of modern regional climate". Contacts were made with researchers at UNLV, the Las Vegas Valley Water District (WRD), and with I. Friedman and G. Smith (USGS-GD) to receive samples and/or data to adequately cover the Great Basin region with collection sites.

J. Whelan and R. Moscati collected samples of calcite and opal from fracture coatings and lithophysal cavities of the upper lithophysal zone of the Tiva Canyon from the excavation at the site of the North Ramp Borehole. These samples will be very useful for comparison with the data from the trenches in the area (especially 5, 14, and 14D).

3GQH832A Prepare mineralogic/petrologic description of specimens

R. Moscati logged into HD system samples from UZ-16 and began petrologic description of same.

J. Whelan examined approximately 30 thick sections from drill core samples of the unsaturated zone for evidence of dissolution events during the history of calcite precipitation. This was in support of a white paper being prepared by R. Forester.

3GQH833A Prepare isotope composition / fluid inclusion history

B. Marshall installed all of the common data bases onto the YMP PC to allow network access and faster processing. In addition, a brief instruction manual for using the data bases was written.

J. Paces performed a series of calculations to determine the proper concentrations of U and Th tracer solutions for future analysis of U-series by mass spectrometry, as well as atom-to-activity conversion factors. New U and Th tracer solutions (spikes U1 and Th1) were prepared by diluting existing stock solutions, and preparations were made to determine spike concentrations by mass spectrometry in the next several weeks.

S. Mahan and K. Futa completed Sr isotopic analyses of Paleozoic carbonates collected by J. Cole from Nellis Air Force Base including the Black Hills, Pintwater Range, Desert Range, and the north end of Yucca Flat. Most rocks contain $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of 0.7080 to 0.7092, typical for Paleozoic carbonates such as the Antelope Valley Limestone, Nopah Formation and the Guillemite Limestone.

K. Futa investigated the feasibility of analyzing ^{90}Sr in carbonates derived from above-ground nuclear testing as a tracer for pedogenic and infiltration studies. Trace amounts of ^{90}Sr must be determined by β -emission on relatively large-sized samples. If it is decided that ^{90}Sr analysis would prove informative for determining rates of Sr flux, chemistry could be completed using GSP-IGG facilities, and purified Sr concentrates could be submitted to qualified contractors.

3GQH833B Prepare isotope composition/fluid inclusion history

R. Moscati and J. Whelan performed 42 analyses of calcite sampled from USW GU-3 and 9 of calcite sampled from UE25 A-5, completing reconnaissance analysis of both cores. The data from GU-3 were remarkably consistent down to nearly 1200 feet, with $\delta^{13}\text{C}$ values of $-6 \pm 1\%$ and $\delta^{18}\text{O}$ values of $19 \pm 1\%$; these values are very similar to those of the pedogenic calccrete calcite found on Yucca Crest. The influence of the soil geochemical environment apparently extended much deeper at the southern end of Yucca Mountain, possibly due to a lesser influence of the 10.5 ma hydrothermal system related to the Timber Mountain event.

T. McConnaughey and J. Whelan extracted the CO_2 from 10 samples of air and analyzed its O and C isotopic compositions as part of procedure development testing for the soil gas studies; precision was very good.

T. McConnaughey and R. Moscati extracted the CO_2 from 12 soil gas samples collected at the NTS. These were placed in break seals awaiting an opportunity for determination of their $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values.

Preparation of approximately 30 thick sections for cathodoluminescence and fluid inclusion studies should be completed by the end of this month.

Fifteen standards were run during the course of the months stable isotope measurements.

Quality Assurance:

3GQH833A Prepare isotope composition / fluid inclusion history

S. Mahan, with the assistance of D. Craft, completed calibration of the NBS #2 6" mass spectrometer as per GCP-12,R3 Rb-Sr Isotope Geochemistry on 3/4/93. Calibration status forms were submitted to W. Rodman.

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

J. Whelan and T. McConnaughey prepared, and received signature approval of, GCP-30, "Carbon dioxide measurement with EGM-1 and WMA-2 portable IRGA"; GCP-31T, "Collection of neo-formed carbonate from soils"; and GCP-32T, "Collection of soil gases and moisture for stable isotope analysis".

R. Moscati and J. Whelan completed reading assignments covering revisions to procedures for TDIFs, software, procurement, and scientific notebooks; and attended GERT training.

WBS 1.2.3.7 Resource Potential

Principal Investigator - Z. Peterman

OBJECTIVE

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

WBS 1.2.3.7.2 Present and Future Value of Resources

Principal Investigator - Z. Peterman

OBJECTIVE

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

WBS 1.2.3.7.2.1 Natural Resource Assessment

Principal Investigator - C. Hunter

OBJECTIVE

To identify and assess the natural resource potential at the proposed repository site at Yucca Mountain. (SCP Study 8.3.1.9.2.1)

SCP 8.3.1.9.2.1.1 Geochemistry assess of Yucca Mountain 0G3721A93

Summary Account Manager - C. Hunter

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GNR003B Compile radiometric data, known mineral occurrences

J. Berquist initiated requests for computerized plots of maps showing location of sampling sites for K-Ar and other ages that relate to mineralization.

Z. Peterman, along with J. Aleinikoff (GD-Isotope Geology) and S. Monsen (USGS volunteer), collected samples of Paleozoic limestones and dolomites from mineralized areas in Bare Mountain (February 23-26). Although the project is funded by the Geologic Division Development of Assessment Techniques Program, the results will have direct bearing on the future mineral assessment of Yucca Mountain. The scope of the investigation involves determining possible changes in lead and strontium isotopic compositions of the limestones during mineralization from the primary marine Sr values of host carbonates. This can only be accomplished by overwhelming or replacing the indigenous Sr with additional Sr introduced by the hydrothermal fluids. If this hypothesis is substantiated by the current study, Pb and Sr isotopes will be of immense value in assessing potential mineralization. During the collecting trip, the active Sterling gold mine was visited, samples were collected,

and arrangements were made for a future trip underground.

Quality Assurance:

3GNR003B Compile radiometric data, known mineral occurrences

J. Berquist completed reading assignments and training as required.

SCP 8.3.1.9.2.1.4 Assessment of hydrocarbon resources 0G3721D93

Summary Account Manager - Z. Peterman

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GNR002A Evaluate hydrocarbons in Railroad Valley analog

An additional 15 sonic logs from Railroad Valley were digitized in March, allowing computation of accurate depth versus time curves for key exploration wells along seismic reflection lines near the prolific Grant Canyon oil field. To date, 35 well logs have been digitized. In April, J. Grow expects to digitize another five to eight sets; he will then begin a synthesis report on the sonic velocities for wells on or near the seismic lines being analyzed in Railroad Valley.

Quality Assurance:

J. Grow attended the training session on "Scientific Notebooks" on March 23, 1993. Grow and C. Barker will be submitting the "Initial Entries" for notebooks in April.

1.2.5 REGULATORY AND INSTITUTIONAL

OBJECTIVE

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

WBS 1.2.5.2 Licensing

OBJECTIVE

To review, analyze and interpret regulatory requirements to provide licensing guidance to the Project; to integrate licensing concerns and the needs of the Project; and to define licensing strategies.

WBS 1.2.5.2.2 Site Characterization Program

Principal Investigator - W. Dudley, Jr.

OBJECTIVE

To provide ongoing regulatory planning and evaluation of the site characterization program; and integrate regulatory evaluations into the site program.

ACTIVITIES AND ACCOMPLISHMENTS

D. Appel reviewed and edited input prepared by hydrology-program investigators for the YMP Site Characterization Progress Report No. 8 which covers the period October 1992 through March 1993. A. Yang and J. Higgins prepared the UZ-hydrochemistry section for the semi-annual "Site Characterization Progress Report 8 -- Yucca Mountain, Nevada, October 1, 1992 to March 31, 1993" for submission to DOE/Las Vegas.

A scoping meeting was prepared for and attended and was followed by the preparation of materials for presentation at the NWTRB meetings in April.

Two reviewers from Study Plan 8.3.1.2.2.9, R0 still have not come to concurrence with the PI on the author/reviewer comment resolution. Section 3.0 was provided to the PI per his request.

Technical and other support was provided for draft revision of YMP-USGS Study Plans 8.3.1.2.2.7, R1, Hydrochemical Characterization of the Unsaturated Zone; 8.3.1.2.2.4, R2, Characterization of the Yucca Mountain Unsaturated Zone in the Exploratory Studies Facility; and 8.3.1.2.2.6, R1, Characterization of Gaseous-Phase Movement in the Unsaturated Zone.

HIP submitted to the YMPO on 03/19/93 the USGS responses to the State of Nevada comments on Study Plan - 8.3.1.2.2.7, R1 "Hydrochemical characterization of the unsaturated zone".

WBS 1.2.5.3 Technical Data Base Management

OBJECTIVE

To manage, maintain, and accumulate technical data and information produced by site characterization, design development, and performance assessment activities for the Project.

WBS 1.2.5.3.5 Technical Data Base Input

Principal Investigator - L. Hayes

OBJECTIVE

To provide the hardware, software, personnel, and procedures needed to provide data to the technical data base and to report the acquisition and development of data to the ATDT.

ACTIVITIES AND ACCOMPLISHMENTS

This month 39 TDIFs were received into the PDA. Current entries in the ATDT as well as most of the outstanding entries were quality checked, bringing the outstanding number below 30. In addition to the new entries, many TDIFs were corrected in the course of completing regular work. Data base development to track TDIFs through the PDA is progressing on schedule.

I. Standard data base maintenance

Routine jobs were performed throughout the month, including the retrieval of the water quality data from the WRD NWQL, entering the data into the water quality subsystem of the WRD/HIP NWIS data base. The maintenance and cleanup of the SATIN and ADAPS logs and directories were accomplished on schedule. Both ADAPS and SATIN are also subsystems within the HIP NWIS data base. Backup of all the NWIS database subsystem files was performed and the backup tape sent to the LRC for storage in the fire proof vault.

II. Satellite transmissions

D. Burkhardt converted data to water levels for well H-1, tubes 2, 3 and 4. Some of this data took longer to convert due to the many changes in the collecting program within the collecting year. Also completed were wells H-4, H-5 and the upper zone of H-6. Burkhardt

is now working on the conversion of well H-3. He also spent considerable time reviewing the plots for the 1985 through 1988 water year data reports, to verify accuracy.

III. Data logger data

D. Burkhardt continued his assistance to A. Riggs in working with his meteorological data. All the formats now are set in the DECODES software for Alan to start importing his CR21X data into the data base as it comes in. Burkhardt also helped Alan create the processor and shift records within the data base. Once these were established, they began working with the plots and daily values tabling available within the database.

IV. User Assistance

B. Kerans completed a written review and notes on the Administrative Unit's options for hardware needs, from the meeting held in February. The Data Management Unit assisted in setting up proper access and facilities for the Administrative Unit to transfer data from the older Administration software to the new Ingres based Administrative Information System (AIS).

The Unit researched a question by Alan Riggs concerning the application of the equation facilities within the National Water Information System (NWIS-I) data base.

B. Oatfield reviewed the SPN program that allows access to information on various laboratory schedules used by the NWQL. This information was passed on to J. Czarnecki for use in submitting future water quality samples.

V. Software installation

D. Burkhardt spent time testing the latest version of a software port of some of the satellite data base from the PRIME to the new Data General hardware. A report on the testing accomplished and problem areas found was submitted for further software modifications.

B. Oatfield continued testing the XONE X-emulation package for PC access to Unix based systems. Information for file setups and problem areas was documented and passed to the Computer Operations Unit.

VI. Software quality assurance

B. Kerans attended the regular software CCC meeting and a special meeting of the CCC. A written review of some comments on the CCC Charter from the HIP was submitted.

VII. Data administration

B. Oatfield continued work on defining the various components of the unsaturated zone parameters for inclusion in the NWIS data base. Oatfield also worked on establishing various sites properly within the NWIS data base. These sites need to be co-ordinated properly with the Nevada, California and DOE test site locations already in place.

VIII. Training

D. Burkhardt and B. Kerans attended a LRGS training and seminar. The satellite data will be moving from the DRGS to the LRGS within the next year.

D. Burkhardt attended 'Managing Ingres Data Bases' training March 22-25.

WBS 1.2.5.4 Performance Assessment

OBJECTIVE

To conduct investigations and develop mathematical models examining the performance of the MGDS in the preclosure and postclosure phases; to verify, validate, benchmark, and document codes for assessing the performance of the overall waste isolation system; and to analyze the performance of the total system and subsystems.

WBS 1.2.5.4.4 Site Performance Assessment

Principal Investigator - A. Flint

OBJECTIVE

To integrate physical process submodels and data into computational models for prediction of performance of the site (including uncertainties); and assess whether the site will meet requirements for ground-water travel time in 10 CFR 60.113(a) (2). (SCP Sections 8.2.2 and 8.3.5)

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GPA004 Develop 1-D and 2-D matrix models

The 1-D flow code is being modified to incorporate a dual porosity fracture network.

Fracture properties initially are set as uniform to test the mesh. Once the fracture properties are established from activity 3GPA008 and fracture densities are estimated from UZ-16, a modified mesh will be created and new properties assigned.

The 2-D flow model is finished and a draft paper is in internal review. The paper is in format and will be published as a SAND report. A fracture network will be established for the 2-D model at a later date.

3GPA008 Analyze fracture/fault fill and develop model

Water retention curves from the fault fill in Trench 14 are currently being determined using the CX-2. A rock core with fracture filling has been sliced in thin layers to determine alteration from the fracture into the bulk rock away from the fracture. The thin slices are being used to determine porosity, bulk density, grain density and water characteristic curves. Similar whole rock cores are being used to measure imbibition properties of the fracture coating and the unaltered rock core.

WBS 1.2.5.4.6 Development and Validation of Flow and Transport Models

Principal Investigator - A. Flint

OBJECTIVE

To develop and validate the calculational models that (1) are used primarily in assessments of performance for the resolution of Issues 1.1, 1.2, 1.3, 1.6, 1.8, and 1.9; (2) describe fluid flow or the transport of energy/or radionuclides; and (3) are not used exclusively in the resolution of a single issue; and to follow applicable quality-assurance procedures.

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GVF003 Develop and refine data for INTRAVAL program

Hydrologic properties from UZ-16 core are currently being analyzed in the hydrology laboratory. These values are the data that are being estimated by the modelers in the INTRAVAL program. An update data set will be sent in April, which will include unit

contacts, water levels and the any core measurements to date.

WBS 1.2.5.4.7 Supporting Calculations for Postclosure Performance Analyses

Principal Investigator - A. Flint

OBJECTIVE

To provide documentation and results of calculations used in analyses of postclosure performance that support design efforts, contribute to the resolution of Issue 1.3, and indirectly support activities carried out under other performance assessment WBS elements.

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

3GPC007 Measure thermal effects on rock properties

A presentation of the current data set was made at the CASY symposium by A. Flint. Although the paper was withdrawn from the IHLWC, A. Flint was asked by the IHLWC organizers to present an informal presentation on the results. The organizers feel that this important issue needs to be discussed in a timely manner due to the current consideration on a high temperature repository.

Core samples have been sliced into thin layers to determine if water characteristic properties have been altered by the high temperature treatments. These samples are being tested to determine bulk density, grain density and porosity. Once this is finished the samples will be run through the CX-2 to determine water retention characteristics.

1.2.9 PROJECT MANAGEMENT

OBJECTIVE

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

WBS 1.2.9.1 Management and Integration

OBJECTIVE

To provide overall management for contract activities; and to perform project-level coordination of project management activities.

WBS 1.2.9.1.2 Technical Project Office Management

Principal Investigator - L. Hayes

OBJECTIVE

To provide overall technical project office management activities for the Yucca Mountain Site Characterization Project Office.

WBS 1.2.9.2 Project Control

OBJECTIVE

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

processes.

WBS 1.2.9.2.2 Participant Project Control

Principal Investigator - R. Ritchey

OBJECTIVE

To develop, maintain, integrate, control and report the participant cost and schedule plans, and to participate in change control.

ACTIVITIES AND ACCOMPLISHMENTS

Development of a process for implementing internal change control to monitor changes to the baseline schedules was initiated. A "soon-to-come-due" list for the study areas was developed, to provide management with a 90-day look ahead at the deliverable items coming due. The USGS schedule status was input, earned value was calculated, and information was uploaded to the VAX in Las Vegas on schedule.

A data base to track USGS milestones was developed to generate a report that depicts milestone satisfaction criteria, milestone level, responsible staff, baseline date, planned date, and actual completion date.

A cost/schedule change request was prepared and submitted to DOE that transfers FY93 funds to CRWMS M&O/Intera to enable Golder Associates to assist two hydrology projects with applications of the FRACMAN fracture-network model.

1.2.11 QUALITY ASSURANCE

OBJECTIVE

Includes work scope related to the development and maintenance of project participants assurance programs, consisting of all those planned and systematic actions, necessary to provide adequate confidence that the information to obtain a license for siting, constructing and operating a geologic repository and monitored retrievable storage facility will be met and complies with Federal regulations.

WBS 1.2.11.1 Quality Assurance Coordination and Planning

Principal Investigator - T. Chaney

OBJECTIVE

To coordinate and support the activities that are performed within the Quality Assurance WBS element.

ACTIVITIES AND ACCOMPLISHMENTS

Three ACSRs are in process for GSP and will go through the GAC review mid April. They are as follows:

YMP-USGS-ACS-G1232412-1,R0	Tectonic Models and Synthesis
YMP-USGS-ACS-G1232412-2,R0	Evaluate Tectonic Models
YMP-USGS-ACS-G1232846-1,R0	Evaluate Age and Recurrence of Movement on Suspected and Known Quaternary Faults

All USBR Quality Management Procedures and the USBR Quality Assurance Program Plan were deleted in accordance with CAR 92-07.

WBS 1.2.11.2 Quality Assurance Program Development

OBJECTIVE

To establish and maintain the QA program documents.

ACTIVITIES AND ACCOMPLISHMENTS

A Draft Matrix for the DOE QARD has been completed indicating which requirements are met by our present program, which requirements are not applicable, and which requirements will require changes to our program. This process identified 15 existing QMPs requiring revision, four new QMPs to be developed, and seven QMPs requiring modification.

Teams are being developed to participate in the development of new procedures and the preparation of revisions and/or modifications to existing procedures. A schedule is being prepared to track each team's or individual's progress. The teams will work on software, samples, data, and technical procedure preparation.

The following final draft QMPs or modifications received QA and TPO approval and were sent to Reston for signature approval:

QMP-1.01,R4-M2	Organization procedure
QMP-2.01,R2-M4	Management assessment of YMP-USGS QA program
QMP-2.07,R1-M5	YMP-USGS instruction
QMP-4.01,R4-M1	Procurement document control
QMP-5.01,R4-M4	Preparation of technical procedure
QMP-15.01,R4-M5	Control of nonconforming items

The following draft QMPs or modifications received signature approval and were sent on to Document Control for issuance:

QMP-4.01, R4	Procurement document control
QMP-5.05, R3	Scientific notebook system
QMP-7.01, R5	Control of purchased items and services
QMP-10.04, R0	Supplier evaluation

Input of data, tracking dates of assignment, and other details necessary to keep the open items data base current were handled. Daily and weekly Status of Open Items were prepared and input to the Open Items data base for trending.

The February Open Items and Trend Analysis Reports were written and issued.

1.2.11.3 Quality Assurance Verification

OBJECTIVE

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

WBS 1.2.11.3.1 Quality Assurance Verification - Audits

Principal Investigator - T. Chaney

OBJECTIVE

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

ACTIVITIES AND ACCOMPLISHMENTS

Audit USGS-93-06, an internal audit of six SCP Activities was conducted resulting in one audit finding and eight audit observations.

The Audit Report for USGS-93-07, an external audit of vendor Campbell Scientific Inc., was completed, recommending retention of the vendor on the Approved Suppliers List.

Audit USGS-93-08, an internal programmatic audit of criteria 3, 4, 7, 17, and verifications of several deficiency documents, was submitted.

Initial planning of Audit USGS-93-09 of vendor IFR, Inc., tentatively scheduled for mid-April was started.

Responses to Corrective Action Reports CAR-91-09 (related to software requirements transition problems), CAR-90-04, R1 (related to untimely resolution of deficiency documents), and Nonconformance Reports NCR-93-01 (related to calibration requirements not met by UNRSL), NCR-93-03 (related to software documentation problems), NCR-93-04 (related to software documentation problems), NCR-93-07 (related to software documentation problems), NCR-93-08 (related to lack of a technical procedure), and NCR-93-11 (related to QMP-4.01 implementation problems) were researched and evaluated.

Special Investigative Reviews of AFR-9203-01, AFR-9205-03, AFR-9205-10, and NCR-92-24 were completed. Reports were written that recommended the closure of the four deficiency documents. The NCR Records Package was submitted to the Local Records Center.

Several Nonconformance Reports and distribution memoranda were written. These NCRs included NCR-93-10 (related to vendor calibration certificate problems), NCR-93-12 (related to the purchase of a calibration without a Purchase Requisition), and NCRs 93-13 through 93-21 (related to manuscripts published without appropriate reviews and approvals).

Specific corrective action statements for each of 105 procurement file record packages under Nonconformance Report USGS-NCR-91-25 were evaluated and reported.

Supplier evaluations USGS-93-E12 of Hewlett Packard and USGS-93-E13 of MKS Instruments, Inc. were conducted and reported, recommending retention of both, on the Approved Suppliers List. An evaluation of vendor EG&G Geometrics, USGS-93-E14, was conducted and a report was issued recommending expansion of their approved services. Supplier Evaluation USGS-93-E15 of Ruska Instruments Corp. was completed and a draft report was written.

An evaluation of a corrective action statement provided by Colorado State University in response to concerns generated during vendor evaluation USGS-93-E03 was evaluated. A recommendation to include Colorado State University on the YMP-USGS Approved Suppliers List resulted.

WBS 1.2.11.3.2 Quality Assurance Verification - Surveillances

OBJECTIVE

To verify the YMP USGS QA program through periodic audits and surveillances of Project activities.

ACTIVITIES AND ACCOMPLISHMENTS

A field surveillance, Surveillance USGS-93-S03, of on-going USGS work at borehole UZ- conducted by personnel from SCP Activity 8.3.1.2.2.6.1 was planned and conducted. No problems

were found.

Surveillance USGS-93-S04 of geologic mapping associated with SCP Activity 8.3.1.4.2.2.1 and Surveillance USGS-93-S05 of borehole geophysical surveys associated with SCP Activity 8.3.1.4.2.1.3 were planned for the first week in April.

WBS 1.2.11.5 Quality Assurance - Quality Engineering
Principal Investigator - L. Hayes

OBJECTIVE

To provide quality engineering support to the project through reviews of documentation and assistance with QA training.

ACTIVITIES AND ACCOMPLISHMENTS

QMP-5.03 reviews and/or resolution of comments were completed and documented for eight QMP modifications.

YMP-USGS reviews of AP-5.21, R4, Field Work Activation, and AP-10.1, R1, Nuclear Waste Fund Property Management Instruction, were completed and returned to the DOE.

The log of USBR work requests was distributed. No new USBR work authorization requests were received or anticipated during March. The prerequisite reviews and maintenance of the log will no longer be needed and are considered completed actions under YMP-USGS Corrective Action Report USGS-CAR-92-07.

The QA Open Items Committee met during March to discuss the status of corrective actions and other implementation issues.

External Item(s) addressed concerned DOE/YMQAD CARs YM-91-74 through YM-91-76 (software requirements) and 93-15 (data).

Internal Item(s) addressed concerned Aud: Finding Reports/Observations AFRS 9210-03 (annual document control configuration check), AFR 9302-01 (scientific notebook record submittals), and meetings and discussions of results for Audit 93-06; CARs: 90-04 R1 (YMPB and QA timeliness of corrective actions), 91-01 (graded QA transition), 91-03 (unapproved vendors), 91-05 (procurement records submittals), 91-06 (management assessment), 91-07 (calibration requirements), 91-09 (software requirements), 91-10 (exemptions from procurement requirements), 91-11 (scoping activities without documented authorization), 92-02 R1 (HIP timeliness of corrective actions), 92-05 (publications processing), 92-06 (technical procedure requirements), 92-07 (USBR QA program problems), 92-08 (AP-5.1Q data submittals to LRC/CRF), 92-09 (emergency response to 6/92 earthquake), 92-10 (procurements made by outside organizations), and 92-11 (data scheduling trend); NCRs: 92-13 (OFR processing), 93-03, 93-04 & 93-07 (implementation of software requirements), 93-09 (report processing), and 93-11 & 93-12 (QMP-4.01 procurement requirements).

Work continued in support of the ongoing FY92 QA Management Assessment.

Work was coordinated with YMPB Project Control, M&O, and SNL personnel to complete the draft YMPO required Transition Plan for transitioning WBS #1.2.3.2.6.2 activities from the USGS to SNL.

Approximately 45 Software Documents have been received, reviewed, and/or processed by the SCM Coordinator in accordance with QMP-3.03, R3. The Configuration Status Log has been updated and

Technical Contacts have been notified of status of their software documents.

The Configuration Status Accounting Quarterly Update for the three months ending March 31, 1993 has been completed and submitted.

An Agenda and Minutes were prepared for Configuration Control Committee meetings held on March 4 and 18. CCC Review documentation was completed for each of the CCC Reviews conducted at this meeting.

1.2.12 INFORMATION MANAGEMENT

OBJECTIVE

Includes work scope related to the project-level establishment of systems to facilitate organization, storage, and retrieval of information/documents.

1.2.12.2 Records Management

OBJECTIVE

To provide a YMP Records Management System that will meet the requirements of: DOE/RW-0214, Quality Assurance Requirements Document for the Civilian Radioactive Waste Management Program; DOE/RW-0194P, Records Management Policies and Requirements; ANSI/ASME NQA-1, Quality Assurance Requirements for Nuclear Facilities (Requirement 17 and 17S-1, Quality Assurance Records), and the Licensing Support System (LSS).

WBS 1.2.12.2.2 Local Records Center Operation

Principal Investigator - L. Hayes

OBJECTIVE

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

ACTIVITIES AND ACCOMPLISHMENTS

Two hundred sixty-eight individual records and 132 criteria packages were received by the LRC. One record required QA designation changes; and 36 packages (26 percent) required corrective actions. Seventy-three individual records and 103 criteria packages (3,817 pages); nine publication packages and no data packages (1,114 pages); and no current cited references; four backlog publications, four other records packages, and 45 backlog cited references for a total of 1,177 pages were transmitted to the CRF from the LRC. No corrective actions were requested of the USGS, making the accuracy rate 100 percent. All records were received by the LRC and transmitted to the CRF within procedure required time.

The LRC staff re-evaluated their activities resulting in many activities being combined, dropped or otherwise changed. Resulting savings are in the following areas:

- . Fewer items for each records package are indexed into EasyRex.
- . A printout of a data base of cited references on file at the Project Office eliminates many hours required in the past to obtain cited references for both current and backlog reports.
- . Maps which were labor-intensive to copy for records are now being purchased at minimal

cost.

An inventory of the material in the LRC which has not been processed as records has been completed. This material is being processed for appropriate final disposition as entry to the PDA, submittal as backlog records, etc.

Processing of backlog material is progressing as anticipated. Records which are complete have been submitted to the CRF.

A meeting with M. Jones, E. Jorgensen, T. Limon, and N. Trentman from the Project Office was productive in getting access to DOE/YMP computer services needed for LRC activity support. They provided a keyboard mapping for the LRC computer keyboards providing quicker access to the Las Vegas VAX, a printout of a data base of cited references which will save many hours of research, access to all E-Mail functions and several other time-saving helps.

WBS 1.2.1.2.5 Document Control

OBJECTIVE

To provide a Yucca Mountain Project Records Management System that will meet the requirements of: DOE/RW-0241, Quality Assurance Requirements Document for the Civilian Radioactive Waste Management Program; DOE/RW-0194P, Records Management and Requirements, ANSI/ASME, NQA-1, Quality Assurance Requirements for Nuclear Facilities (Requirement 17 and 17-S1, Quality Assurance Records), and the Licensing Support System (LSS).

ACTIVITIES AND ACCOMPLISHMENTS

All Document Transmittal Notices (DTNs) for the annual configuration check were received within the required time. The Document Control office's pro-active approach to encourage controlled document Holders to return their DTNs within the required time has brought the number of late DTNs down to only four during this month. Besides supporting the QA Program, it has eliminated much correspondence.

The following approved Quality Management Procedures and Modifications were distributed:

QMP-1.01,R4-M2	Organization procedure
QMP-2.01,R2-M4	Management assessment of YMP-USGS quality Assurance program
QMP-2.07,R1-M5	YMP-USGS instruction
QMP-4.01, R4	Procurement document control
QMP-4.01,R4-M1	Procurement document control
QMP-5.01,R4-M4	Preparation of technical procedures
QMP-5.05, R3	Scientific notebook
QMP-7.01, R5	Receipt of purchased items and/or services
QMP-7.04, R0	Supplier evaluation
QMP-15.01,R4-M5	Control of nonconforming items

The following Technical Procedures were distributed:

GCP-30, R0	Carbon dioxide measurement with EGM-1 and WMA-2 portable IRGA
GCP-31T, R0	Collection of neo-formed carbonate from soils
GCP-32T, R0	Collection of soil gases and moisture for stable isotope analysis
GP-50, R0	Identification of geomorphic features of possible tectonic using conventional

	and low-sun-angle vertical aerial photographs
HP-07, R2	Method to inject tracer gas to drilling air
HP-160, R2	Methods for analysis of samples for gas composition by gas chromatography
HP-192, R2	Shallow soil gas collection
HP-261T, R0	Collection and processing of rock cutting samples from wells drilled with mud using the rotary hydraulic method
HP-262, R0	Collection of chlorofluorocarbon (CCL ₃ F and CCL ₂ F ₂) gas samples for age dating

The following USBR documents were rescinded.

YMP-USBR-QAPP and QAPP ICN-1, Quality assurance program plan
 YMP-USBR-QMP-2.03, R1
 YMP-USBR-QMP-3.07, R1 and R1MOD1
 YMP-USBR-QMP-3.13, R0
 YMP-USBR-QMP-4.01, R2
 YMP-USBR-QMP-5.02, R2
 YMP-USBR-QMP-5.03, R1 and R1MOD1 and R1MOD2
 YMP-USBR-QMP-5.04, R0
 YMP-USBR-QMP-6.01, R0
 YMP-USBR-QMP-7.01, R1 and R1MOD1
 YMP-USBR-QMP-8.01, R0
 YMP-USBR-QMP-12.01, R0

There are no longer any USBR controlled documents still in effect on the Yucca Mountain Project. Two participants from the USBR, were decontrolled, leaving only five USBR personnel on controlled distribution.

USGS procedure QMP-5.02, R3, "Preparation and control of drawings", was rescinded.

Full sets of ACSR were issued to D. Gillies and J. Woolverton. Full sets of QMPs were issued to G. Brown and B. Scavuzzo.

Ten DTN record packages were submitted to the LRC.

1.2.13 ENVIRONMENT, SAFETY, AND HEALTH

OBJECTIVE

Includes work scope related to environmental compliance, monitoring, and safety and health.

WBS 1.2.13.4 Environmental Field Programs

OBJECTIVE

To identify data requirements; to collect required environmental field data; and to prepare topical data reports.

WBS 1.2.13.4.7 Water Resources

Principal Investigator - R. LaCamera

OBJECTIVE

To provide water resources environmental field activity planning documents, field data and analyses, and topical reports describing the results of field data analyses.

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities:

3GWR021 Conduct ground-water monitoring FY93

Ground-water levels were measured at 26 sites. Discharge was measured at one flowing well. Ground-water data collected during February were checked and filed. Historical ground-water data for four wells were entered into data base. Verified reported elevations of land surface, reference points, and measurement points of three wells with surveying equipment. Received two new electric water-level tapes. Calibrated four electric water-level tapes. Checked the equipment calibration at well JF-3.

3GWR033 Environmental program support, FY93

Prepared and delivered status report for February to DOE and HIP. Participated in DOE midyear program review. Presented and discussed funding level and planned expenditures. Projected expenditures against funding level. Discussed status of wells MV-1 and AD-6 with respect to water-level data collection and plans for content of annual water-resources report.

3GWR035 Prepare water-resources report through FY92

Checked and reviewed electronically collected water-level data. Prepared tabular and graphical summaries using existing databases and available data. Discussed status of report preparation and equipment required to complete preparation of report at DOE midyear review.

Planning and Operations:

3GWR021 Conduct ground-water monitoring FY93

Measure ground-water levels at all accessible sites in the monitoring network, and check and file data collected. Check and file ground-water data collected during March.

3GWR033 Environmental program support, FY93

Prepare and deliver March status report. Investigate and report on status of wells MV-1 and AD-6. Deliver provisional water-quality data to DOE.

3GWR035 Prepare water-resources report through FY92

Continue to compile, evaluate, and summarize data to be included in the report and schedule meeting with DOE to refine content of the report.

3GWR026 Prepare ground-water monitoring report 2nd quarter FY93

Prepare and deliver 2nd quarterly report to DOE by April 30, 1993.

Variances:

3GWR021 Conduct Ground-Water Monitoring FY93

Water-level data were not collected at MV-1 or AD-6. MV-1 was not measured because it does not have an access tube to allow water-level measurements. AD-6 is currently the owner's only pumping well and the owner feels that a water-level measurement may affect operation of the well. Nearby well AD-5 is currently measured and provides monitoring data for the area.

1.2.15 SUPPORT SERVICES

OBJECTIVE

Includes work scope related to project-level general administrative and project support activities.

WBS 1.2.15.3 Yucca Mountain Site Characterization Project Support for the Training Mission
Principal Investigator - L. Hayes

OBJECTIVE

To manage the resources and perform work in support of the YMP training mission developed and implemented by the Yucca Mountain Site Characterization Project Office and YMP participants.

ACTIVITIES AND ACCOMPLISHMENTS

Various routine training functions were performed including distributing individual reading assignments; scheduling DOE General Employee Training (GET); administering GET Refresher Examination for Denver area trainees; distributing reminder notices for overdue reading assignments; processing and filing training records; submitting packages to the Local Records Center; distributing T&MSS and YMP-USGS Calendar of Training Events; distributing biweekly participant instruction assignment status reports; and submitting monthly YMP-USGS Training Statistics to DOE.

YMP-USGS personnel were scheduled and classroom announcements were distributed for the following classroom sessions:

- YMP-USGS Orientation - Denver
- Software Quality Assurance Overview - Denver, Menlo Park
- Software Quality Assurance Implementation Workshop - Denver, Menlo Park
- Question and Answer Session for Data Management - Denver, Reno
- Question and Answer Session for Scientific Notebook System - Denver
- Procurement Briefing for YMP Branch Administration Personnel - Denver
- General Employee Training - Denver
- General Employee Radiological Training - Denver

Mass reading assignments with highlight sheets were distributed for:

- QMP-4.01, R4 Procurement document control
- QMP-4.01, R4-M1 Procurement document control
- QMP-5.05, R3 Scientific notebook
- QMP-7.01, R5 Receipt of purchased items and/or services
- QMP-7.04, R0 Supplier evaluation

Technical procedure reading assignments were distributed for:

- GCP-30, R0 Carbon dioxide measurement with EGM-1 and WMA-2 portable IRGA
- GCP-31T, R0 Collection of neo-formed carbonate from soils
- GCP-32T, R0 Collection of soil gases and moisture for stable isotope analysis
- GP-50, R0 Identification of geomorphic features of possible tectonic Origin using conventional and low-sun-angle vertical aerial photographs
- HP-07, R2 Method to inject tracer gas to drilling air
- HP-160, R2 Methods for analysis of samples for gas compositions by gas chromatography
- HP-192, R2 Shallow soil gas collection
- HP-261T, R0 Collection and processing of rock cutting samples from wells Drilled with mud using the rotary hydraulic method
- HP-262, R0 Collection of chlorofluorocarbon (CCL3F and CCL2F2) gas samples for age

dating

Reading assignment instruction was waived for the following modifications:

QMP-1.01,R4-M2	Organization procedure
QMP-2.01,R2-M4	Management assessment of the YMP-USGS quality Assurance program
QMP-2.07,R1-M5	YMP-USGS instruction
QMP-3.03,R3-M3	Software
QMP-5.01,R4-M4	Preparation of technical procedures
QMP-12.01,R5-M3	Instrument calibration
QMP-15.01, R4-M5	Control of nonconforming items

As part of the preparation efforts for QMP-5.05 R3, effective April 2, 1993, a highlight sheet was developed to accompany the reading assignments being issued by the YMP-USGS Training Coordinator. Also, the YMPB QA Implementation Advisor accompanied the Chief, YMPB, and QA Manager, for the Question-and-Answer Classroom session held on March 23, 1993 to address issues or concerns relating to implementation of QMP-5.05. No significant issues or concerns were raised during the session.

Four General Employee Radiological Training (GERT) sessions were held in Denver with 101 YMP-USGS personnel attending. One session of General Employee Training (GET) was held with 14 attendees.



United States Department of the Interior



GEOLOGICAL SURVEY
BOX 25046 M.S. 425
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

IN REPLY REFER TO:

May 12, 1993

WBS: 1.2.9.1.2
QA: N/A

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

I-343829
BMH

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

Dear Carl:

Enclosed is the USGS detailed monthly status report for March, 1993. If you have any questions or comments, please contact Raye Ritchey at 303-236-0517.

Sincerely,

Raye E. Ritchey
for Larry R. Hayes
Technical Project Officer
Yucca Mountain Project Branch
U.S. Geological Survey

Attachment

- DIVISION Dyer
- CC: IORTI
- CC: SIMMONS/SONES-S
- CC: SIMECKA/SMITH-L-4/0
- CC: DIXON/TYNAN
- CC: STUCKER-DOE
- CC: SCHRECONGOST
- CC: WALLACE-DOE
- CC: GERTZ-4/0

REC'D
6/29/94

cc: D. Appel, USGS/Denver
R. Bullock, RSN/Las Vegas
D. Campbell, USGS/Denver
J. Canepa, LANL/Los Alamos
W. Clark, LLNL/Livermore
M. Chornack, USGS/Denver
R. Craig, USGS/Las Vegas
W. Dudley, USGS/Denver
D. Gillies, USGS/Denver
V. Iorii, DOE/Las Vegas
R. Luckey, USGS/Denver
B. Parks, USGS/Denver
Z. Peterman, USGS/Denver
R. Pritchett, REECo/Las Vegas
R. Ritchey, USGS/Denver
E. Roseboom, USGS/Reston
D. Porter, SAIC/Golden
L. Shepard, SNL/Albuquerque
R. Spengler, USGS/Denver
R. St.Clair, TESS/Las Vegas
J. Stuckless, USGS/Denver
N. Trask, USGS/Reston
J. Whitney, USGS/Denver
YMP-USGS Local Records Center 1.1.02

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