U.S. DEPARTMENT OF ENERGY

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YUCCA MOUNTAIN

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

TECHNICAL DATA BASE QUARTERLY REPORT

JANUARY - MARCH 1992

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QUARTERLY REPORT

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Prepared by

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from inputs provided by
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and
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INTRODUCTION

The acquisition and development of technical data are activities that provide the information base from which the Yucca Mountain Site will be characterized and may eventually be licensed as a high-level waste repository. Consequently, it is vital that technical data be controlled and managed to ensure that these data are available for subsequent Yucca Mountain Site Characterization Project (YMP) use. The Project Technical Data Base (TDB) is the repository for the regional and site-specific technical data required in intermediate and license application analyses and models. The TDB Quarterly Report provides the mechanism for identifying technical data currently available from the Project TDB.

Due to the variety of scientific information generated by YMP activities, the Project TDB consists of three components, each designed to store specific types of data. The Site and Engineering Properties Data Base (SEPDB) maintains technical data best stored in a tabular format. The Geographic Nodal Information Study and Evaluation System (GENISES), which is the Geographic Information System (GIS) component of the Project TDB, maintains spatial or map-like data. The Geologic and Engineering Materials Bibliography of Chemical Species (GEMBOCHS) data base maintains thermodynamic/geochemical data needed to support geochemical reaction models involving the waste package and repository geochemical environment. Each of these data bases are addressed independently within the TDB Quarterly Report.

The TDB Quarterly Report is divided into sections for each TDB component and includes appendices within each section, as appropriate. The structure of each section varies due to the differing needs of each TDB component. However, as a minimum, each section identifies technical data currently available within the respective TDB component. Other optional information included within each section has been determined by the appropriate TDB component staff to be pertinent for individuals requesting data.

The Technical Data Management System on the YMP is currently undergoing significant development and expansion that will enable it to evolve into a more efficient system to meet the needs of the Project. These developments include a TDB Handbook, TDB Parameter Dictionary, and an Automated Technical Data Tracking (ATDT) System. A TDB Handbook has been published, which provides guidelines to assist participants in the submission of technical data to, retrieval of technical data from, and modification of previously submitted data in the TDB. The TDB Parameter Dictionary,which is currently being developed, will define specific structures and formats of data to be submitted to the TDB to ensure consistency in the reporting of data, and it will identify attributes associated with the data to ensure entries in the data base are meaningful. Additionally, the TDB Parameter Dictionary will define the component of the TDB in which the data will reside. The ATDT system is an Information Management System designed to trace the development of all technical data acquired by the Project and to maintain the link between the information stored in the ATDT System and the actual records of technical data maintained by the records system. This system was implemented

in December 1991 and is used for the quarterly production of the Technical Data Catalog, which identifies all technical data acquired and developed by the YMP. The TDB Quarterly Report will eventually be merged with the Technical Data Catalog once all of the information about the existing technical data in the TDB has been included in the ATDT System.

SEPDB QUARTERLY REPORT

SANDIA NATIONAL LABORATORIES

TABLE OF CONTENTS

1.0 INTRODUCTION

This Site and Engineering Properties Data Base (SEPDB) Quarterly Report summarizes the current status of the SEPDB and lists Sandia's major activities and accomplishments in the development and operation of the data base during January - March of 1992. The report presents the data that is currently available in the SEPDB and gives instructions for submitting and retrieving data. An example of how data should be compiled for submittal to the SEPDB, a sample data retrieval (SEPDB product), and a blank work request form are also included.

The SEPDB is being developed and operated by Sandia National Laboratories as a component of the Project Technical Data Base in support of a license application. The SEPDB provides the controlled storage and reporting of scientific and engineering data generated by site characterization, performance assessment and design activities. It primarily contains the geologic, hydrologic, and rock property data from core sample testing and field measurements, but is intended for essentially all technical data that is being acquired on the project and is best stored in tabular form.

2.0 SEPDB ACTIVITIES AND ACCOMPLISHMENTS FROM JANUARY - MARCH 1992

1. The following data was entered into the SEPDB, making it available for project use:

   New Data Available for Project Use

   - DA0031: Precipitation measurement and test conditions data from USGS citation number OFR 87-463.
   - DA0045: Drill hole mineralogy data from USGS citation number OFR 81-1349.
   - DA0068: Drill hole and surface sample mineralogy data from USGS, and surface sample locations and descriptions from USGS citation number OFR 81-119.
   - DA0126: Surface sample mineralogy data from USGS citation number OFR 85-47.
   - DA0128: Drill hole mineralogy data from USGS citation number OFR 85-224.
   - DA0155 and DA0159: Solubility of radionuclide data from LLNL reports HEDL-TME85-2 and PNL-7170.
   - DA0156: Drill hole mineralogy data from LANL report LA-11787-MS.
   - DA0162: Surface sample mineralogy data from USGS GS.91.M.000042.

2. The following SEPDB products (data reports) were issued during this quarter:

   SEPDB Products (Data Reports)

   - SEP0107: Drill hole mineralogy and surface sample mineralogy for activity 8.3.1.5.2.1.5 was sent to Mr. Cady Johnson, M&O, Las Vegas, NV.

3. The following data were submitted for entry into the SEPDB:

   SEPDB Data Submittals

   - "Strontium Isotopes in Carbonate Deposits at Crater Flat, Nevada", from the High Level Radioactive Waste Management Proceedings of the Second International Conference, USGS (GS.91.M.000042).

   - "Assessing the Natural Performance of Felsic Tuffs using the Rb-Sr and Sm-Nd Systems--A Study of the Altered Zone in the Topopah Spring Member, Paintbrush Tuff, Yucca Mountain, Nevada", from the Materials Research Society Symposium Proceedings, USGS (GS.91.M.000034).

   - "Distribution of Rubidium, Strontium and Zicronium in Tuff from two deep coreholes at Yucca Mountain, Nevada", from the High Level Radioactive Waste Management Proceedings of the Second International Conference, USGS (GS.91.M.000048).

4. The guest account that was created for the TRW office Fairfax, Virginia was closed. The SECUREID card was returned to Sandia National Laboratories Computer Security Division.

5. Work has continued on incorporating the ATDT system into the SEPDB using TDIF's. The SEPDB staff has began converting accession numbers to data tracking numbers (DIN's). TDIF's are also being made for all data submittals that were made to the SEPDB prior to the conception of the ATDT system. At this time, it is estimated that 20% of the TDIF's for old submittals are completed.

3.0 DATA CURRENTLY AVAILABLE FROM THE SEPDB

The data that is currently available from the SEPDB is detailed by nine different reports presented in Appendix A. These reports provide a comprehensive view of the current contents of the SEPDB. The information presented in each report and the corresponding page numbers are as follows:

1. Types of data currently stored in the SEPDB (pages A1-A2).

2. For each drill hole, the parameters for which data is available including the reference report (pages A3-A10).

3. For each parameter, the drill holes for which data is available including the reference report (pages A11-A17).

4. The data available that is not associated with a drill hole core sample (page A18).

5. The drill holes for which coordinates (Nevada State Plane, Central Zone) are available (pages A19-A20).

6. The drill holes for which bottom hole information (i.e., bottom hole coordinates, total depth, total vertical depth) is available (pages A21-A22).

7. The drill holes for which core information (i.e., length of cored interval, percent recovery) is available (page A23).

8. The hole history reports that have been submitted to the SEPDB from which the drill hole data has been taken (page A24).

9. A complete listing of the reference reports for the data contained in the SEPDB (pages A25-A28).

4.0 INSTRUCTIONS FOR SUBMITTING DATA TO THE SEPDB

The procedure for submitting data to the Technical Data Base is defined in project Administrative Procedure AP-5.2Q, "Technical Information Flow to and from the Yucca Mountain Site Characterization Project Technical Data Base." Appendix A of this report and Appendix C of the Technical Data Management Plan should be used to determine whether or not data should be submitted for entry into the SEPDB. The SEPDB Administrator may also be contacted to discuss the format and scope of the data to be submitted.

5.0 INFORMATION TO INCLUDE WHEN SUBMITTING DATA

In addition to the data values for each parameter, the SEPDB tables have been structured to store important supporting information such as the location of core samples and field measurements, the test method and conditions used to generate the data, and the report in which the data is published. It is important to include this supporting information when submitting data to the SEPDB. The structures of the SEPDB tables are presented in Appendix B. These should be used as guides when compiling data for submittal to the SEPDB. The general structure is as follows:

Parameter Information: List all parameters and their associated data values. Specify the units for each parameter and report any known uncertainties in the data.

Location Information: Report all information that specifies the location of core samples or field measurements. This should include the drill hole name and coordinates, the drill hole depth, and the sample identification number.

Test Conditions: Describe the test method and list all important test conditions such as date, time, temperature, pressure, flow rate, sample size, and instrument type.

Tracking Information: If the data is published, give the reference information for the publication. Report the QA level under which the data was collected, the CRF accession number, the Local Records Center identification number, the SCP activity number, and the WBS number if known.

The SEPDB data compilation shown in Appendix C is an excellent example of how data is best compiled for submittal to the SEPDB.

6.0 INSTRUCTIONS FOR RETRIEVING DATA FROM THE SEPDB

Data is requested from the SEPDB by simply filling out a Work Request form and sending it to the SEPDB Administrator. Blank Work Request forms can be found in Appendix C of this report. Requests for data may also be made by making a telephone call to the SEPDB staff (see Section 7.0 for SEPDB contacts). In either case, the following information must be provided:

1. The requester's name, organization, address, and telephone number.

2. A description of the data that is being requested including a list of the specific parameters.

3. The desired format of the data report (a separate page showing the desired format including column headings is preferred).

No special approvals are required by Project participants to retrieve data from the SEPDB. However, non-participants must obtain approval from the Technical Data Manager at the Project Office who will then notify the SEPDB Administrator of the approved request. Note that data requesters do not have to fill out a TDIF to retrieve data from the SEPDB. The TDIF is completed by the SEPDB staff after the data request is met.

The data that is available from the SEPDB can be reported in a wide range of table structures as specified by the user. This is made possible by the flexibility of the INGRES software used by the SEPDB. In addition, the relational character of the data base enables many different types of data to be reported at specific depths for drill hole core samples and at specific surface coordinates for non-core samples. The SEPDB data report shown in Appendix C is an excellent example of the ability of the SEPDB to provide various types of data in a format that can easily be used in performance assessment and design.

7.0 SEPDB CONTACTS

The SEPDB is operated by Sandia's Technical Projects Division 6316. The primary contacts are:

Rick Orzel	System Manager	FTS 844-2880
Paula Adams	Data Base Specialist	FTS 844-7982

Rick should be the first point of contact with questions on how to submit data and on whether or not data is appropriate for storage in the SEPDB.

Rick should also be the first contact with hardware and software questions including how to use the menu driven program currrrently being developed to interact with the SEPDB from a terminal and how other systems can be connected to the SEPDB. Paula should be contacted first when requesting data reports.

The SEPDB staff welcomes all questions, concerns, and suggestions for improvement. Feel free to contact us at any time by phone or in writing. Written correspondence should be sent to:

SEPDB Administrator
Sandia National Laboratories
Technical Projects Division 6316
P.O. Box 5800
Albuquerque, New Mexico 87185

APPENDIX A

DATA CURRENTLY STORED IN THE SEPDB

PARAMETER	DESCRIPTION
BOTTOM HOLE COORDINATES	Nevada Plane Coordinates for Bottom of Surveyed Drill Holes
BULK DENSITY	Bulk Density Values and Test Conditions
BULK MODULUS	Bulk Modulus Data and Test Conditions
COMPRESSIVE STRENGTH	Compressive Strength Data and Test Conditions
CORE INFORMATION	Core Information, Intervals and Percent Recovery
CURVE FIT	Saturation Curve-Fit Parameters and Test Conditions
DRILL HOLE COORDINATES	Drill Hole Locations, Surveys and Status
DRILL HOLE WATER CHEMISTRY	Water Chemical Constituent Values for Drill Holes
ELASTIC PROPERTIES	Elastic Properties (Poisson's Ratio & Young's Modulus)
FLOOD PREDICTIONS	Flood Predictions (100 yr, 500 yr & Regional Maximum) & Locations
GRAIN DENSITY	Grain Density Values and Test Conditions
HYDRAULIC CONDUCTIVITY	Hydraulic Conductivity Values and Test Conditions
LITHOLOGIC UNITS	Lithologic Unit Depths in Drill Hole
MATRIX POTENTIAL	Matrix Potential Data and Test Conditions
MEASURED FLOODS	Parameters for Measured Floods
MINERALOGY	Mineralogical Samples and Test Conditions
PALEOMAGNETIC	Paleomagnetic Data and Test Conditions
PERMEABILITY	Permeability and Test Conditions
PORE SATURATION	Pore Saturation and Test Conditions
PORE WATER CONTENT	Natural-state Porewater Content Percentages
POROSITY	Porosity Values and Test Conditions
PREDICTED FLOOD LOCATIONS	Cross Section Locations for Predicted Floods
RELATIVE HYDRAULIC CONDUCTIVITY	Relative Hydraulic Conductivity & Test Conditions
SAMPLE LOCATIONS	Location Coordinates for Surface Samples
SONIC VELOCITY	Laboratory Sonic Velocity Measurements
SPRING WATER CHEMISTRY	Water Chemical Values for Springs & Non-Drill Hole Wells
STORAGE COEFFICIENT	Storage Coefficient Values for Well Tests
STRATIGRAPHIC	Thermal/Mechanical Stratigraphic Units
THERMAL CONDUCTIVITY	Thermal Conductivity Data and Test Conditions
TRANSMISSIVITY	Transmissivity Data and Pumping Conditions

WATER LEVEL	Water Elevations and Depths, Dates of Measurements
WATER PRODUCTION	Percent Water Production in Drill Hole Intervals
WELL HYDRAULIC CONDUCTIVITY	Well Test Hydraulic Conductivity Measurements

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
J-11		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
J-12		
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
J-13		
	Bulk Density Values and Test Conditions	USGS WRIR 83-4171
	Grain Density Values and Test Conditions	USGS WRIR 83-4171
	Hydraulic Conductivity Values and Test Conditions	USGS WRIR 83-4171
	Lithologic Unit Depths in Drill Hole	USGS WRIR 83-4171
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Pore Saturation and Test Conditions	USGS WRIR 83-4171
	Natural-state Porewater Content Percentages	USGS WRIR 83-4171
	Porosity Values and Test Conditions	USGS WRIR 83-4171
	Laboratory Sonic Velocity Measurements	USGS WRIR 83-4171
	Transmissivity Data and Pumping Conditions	USGS WRIR 83-4171
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 83-4171
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
		USGS WRIR 83-4171
UE-16d		
	Water Elevations and Depths, Dates of Measurements	USGS 1543-3
	Water Chemical Constituent Values for Drill Holes	USGS 1543-3
UE-16f		
	Water Elevations and Depths, Dates of Measurements	USGS 1543-3
	Water Chemical Constituent Values for Drill Holes	USGS 1543-3
UE-17a		
	Water Chemical Constituent Values for Drill Holes	USGS 1543-4
UE-25 WT #12		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #13		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
UE-25 WT #14		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #15		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #16		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #17		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #3		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #4		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25 WT #6		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
UE-25a #1		
	Bulk Density Values and Test Conditions	SAND88-0811 USGS OFR 81-1338
	Grain Density Values and Test Conditions	SAND88-0811 USGS OFR 81-1338
	Mineralogical Samples and Test Conditions	LA-11497-MS SAND88-0882 USGS OFR 84-491
	Porosity Values and Test Conditions	SAND88-0811 USGS OFR 81-1338
	Laboratory Sonic Velocity Measurements	USGS OFR 81-1338
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
UE-25a #4		
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
UE-25a #5		
	Thermal/Mechanical Stratigraphic Units	SAND84-1076

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
UE-25a #6		
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
UE-25a #7		
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
UE-25b #1		
	Bulk Density Values and Test Conditions	USGS WRIR 84-4253
	Grain Density Values and Test Conditions	USGS WRIR 84-4253
	Hydraulic Conductivity Values and Test Conditions	USGS WRIR 84-4253
	Lithologic Unit Depths in Drill Hole	USGS WRIR 84-4253
	Mineralogical Samples and Test Conditions	LA-11497-MS
		USGS BULL-1777
	Pore Saturation and Test Conditions	USGS WRIR 84-4253
	Natural-state Porewater Content Percentages	USGS OFR 83-855
		USGS WRIR 84-4253
	Porosity Values and Test Conditions	USGS WRIR 84-4253
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Transmissivity Data and Pumping Conditions	USGS WRIR 84-4253
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 84-4253
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
		USGS WRIR 84-4253
	Water Chemical Constituent Values for Drill Holes	USGS OFR 83-855
		USGS OFR 85-484
		USGS WRIR 84-4253
		USGS WRIR 84-4267
UE-25c #1		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
UE-25c #2		
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
UE-25c #3		
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
UE-25p #1		
	Lithologic Unit Depths in Drill Hole	USGS OFR 84-450
		USGS OFR 86-175
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Transmissivity Data and Pumping Conditions	USGS WRIR 84-4248
	Water Elevations and Depths, Dates of Measurements	USGS OFR 84-450
		USGS WRIR 84-4197

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
	Water Chemical Constituent Values for Drill Holes	USGS WRIR 84-4248 USGS OFR 85-484 USGS WRIR 84-4248
UE-29a #1		
	Water Elevations and Depths, Dates of Measurements	USGS OFR 84-142
	Water Chemical Constituent Values for Drill Holes	USGS OFR 84-142
UE-29a #2		
	Water Elevations and Depths, Dates of Measurements	USGS OFR 84-142
	Water Chemical Constituent Values for Drill Holes	USGS OFR 84-142 USGS OFR 85-484 USGS WRIR 84-4267
USW G-1		
	Bulk Density Values and Test Conditions	SAND87-2380 SAND88-0811 UCLR-53602 UCLR-53645
	Saturation Curve-Fit Parameters and Test Conditions	SAND87-2380
	Grain Density Values and Test Conditions	SAND88-0811 UCLR-53645
	Hydraulic Conductivity Values and Test Conditions	SAND87-2380
	Lithologic Unit Depths in Drill Hole	USGS OFR 81-1349
	Matrix Potential Data and Test Conditions	SAND87-2380
	Mineralogical Samples and Test Conditions	LA-11497-MS SAND88-0882 USGS BULL-1777 USGS OFR 81-1349 USGS OFR 84-491
	Porosity Values and Test Conditions	SAND88-0811 UCLR-53602 UCLR-53645
	Thermal Conductivity Data and Test Conditions	SAND88-0624
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW G-2		
	Bulk Density Values and Test Conditions	SAND88-0811
	Compressive Strength Data and Test Conditions	SAND85-0703
	Elastic Properties (Poisson's Ratio & Young's Modulus)	SAND85-0703
	Grain Density Values and Test Conditions	SAND88-0811
	Lithologic Unit Depths in Drill Hole	USGS OFR 83-732
	Mineralogical Samples and Test Conditions	LA-11497-MS SAND88-0882 USGS BULL-1777 USGS OFR 83-732

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
		USGS OFR 84-491
	Porosity Values and Test Conditions	SAND88-0811
	Thermal Conductivity Data and Test Conditions	SAND88-0624
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW G-3		
	Bulk Density Values and Test Conditions	USGS OFR 84-552
	Grain Density Values and Test Conditions	USGS OFR 84-552
	Lithologic Unit Depths in Drill Hole	USGS OFR 84-491
	Mineralogical Samples and Test Conditions	USGS OFR 84-491
	Porosity Values and Test Conditions	USGS OFR 84-552
	Laboratory Sonic Velocity Measurements	USGS OFR 84-552
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW G-4		
	Bulk Density Values and Test Conditions	SAND87-2380
		SAND88-0811
		UCLR-53795
		USGS OFR 84-552
	Saturation Curve-Fit Parameters and Test Conditions	SAND87-2380
	Grain Density Values and Test Conditions	SAND88-0811
		UCLR-53795
		USGS OFR 84-552
	Hydraulic Conductivity Values and Test Conditions	SAND87-2380
	Lithologic Unit Depths in Drill Hole	USGS OFR 84-063
	Matrix Potential Data and Test Conditions	SAND87-2380
	Mineralogical Samples and Test Conditions	LA-10927-MS
		LA-11497-MS
		SAND88-0882
		USGS BULL-1777
		USGS OFR 84-789
	Porosity Values and Test Conditions	SAND88-0811
		UCLR-53795
		USGS OFR 84-552
	Laboratory Sonic Velocity Measurements	USGS OFR 84-552
	Thermal Conductivity Data and Test Conditions	SAND88-0624
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Transmissivity Data and Pumping Conditions	USGS WRIR 86-4015
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 86-4015
	Water Elevations and Depths, Dates of Measurements	USGS OFR 84-063
		USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 84-063
		USGS OFR 85-484
USW GU-3		
	Bulk Density Values and Test Conditions	SAND87-2380
		SAND88-0811

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
		USGS OFR 84-552
	Saturation Curve-Fit Parameters and Test Conditions	SAND87-2380
	Grain Density Values and Test Conditions	SAND88-0811
		USGS OFR 84-552
	Hydraulic Conductivity Values and Test Conditions	SAND87-2380
	Lithologic Unit Depths in Drill Hole	USGS OFR 84-491
	Matrix Potential Data and Test Conditions	SAND87-2380
	Mineralogical Samples and Test Conditions	LA-11497-MS
		SAND88-0882
		USGS OFR 84-491
	Paleomagnetic Data and Test Conditions	USGS OFR 85-48
	Porosity Values and Test Conditions	SAND88-0811
		USGS OFR 84-552
	Laboratory Sonic Velocity Measurements	USGS OFR 84-552
	Thermal Conductivity Data and Test Conditions	SAND88-0624
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
USW H-1		
	Bulk Density Values and Test Conditions	USGS WRIR 84-4032
		USGS WRIR 84-4193
	Grain Density Values and Test Conditions	USGS WRIR 84-4032
		USGS WRIR 84-4193
	Hydraulic Conductivity Values and Test Conditions	USGS WRIR 84-4032
	Lithologic Unit Depths in Drill Hole	USGS WRIR 84-4032
	Matrix Potential Data and Test Conditions	USGS WRIR 84-4193
	Pore Saturation and Test Conditions	USGS WRIR 84-4032
	Natural-state Porewater Content Percentages	USGS WRIR 84-4032
	Porosity Values and Test Conditions	USGS WRIR 84-4032
		USGS WRIR 84-4193
	Relative Hydraulic Conductivity & Test Conditions	USGS WRIR 84-4193
	Storage Coefficient Values for Well Tests	USGS WRIR 84-4032
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Transmissivity Data and Pumping Conditions	USGS WRIR 84-4032
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 84-4032
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4032
		USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS WRIR 84-4032
		USGS WRIR 84-4267
USW H-3		
	Lithologic Unit Depths in Drill Hole	USGS WRIR 84-4272
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Storage Coefficient Values for Well Tests	USGS WRIR 84-4272
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Transmissivity Data and Pumping Conditions	USGS WRIR 84-4272
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 84-4272
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
USW H-4		
	Lithologic Unit Depths in Drill Hole	USGS WRIR 85-4030
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Percent Water Production in Drill Hole Intervals	USGS WRIR 85-4030
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Transmissivity Data and Pumping Conditions	USGS WRIR 85-4030
	Well Test Hydraulic Conductivity Measurements	USGS WRIR 85-4030
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
		USGS WRIR 85-4030
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
		USGS WRIR 85-4030
USW H-5		
	Lithologic Unit Depths in Drill Hole	USGS OFR 83-853
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Water Elevations and Depths, Dates of Measurements	USGS OFR 83-853
		USGS WRIR 83-4171
		USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 83-853
		USGS OFR 85-484
USW H-6		
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Thermal/Mechanical Stratigraphic Units	SAND84-1076
	Water Elevations and Depths, Dates of Measurements	USGS OFR 83-856
		USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 83-856
		USGS OFR 85-484
USW VH-1		
	Lithologic Unit Depths in Drill Hole	USGS OFR 82-457
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Water Chemical Constituent Values for Drill Holes	USGS OFR 85-484
		USGS WRIR 84-4267
		USGS WRIR 86-4359
USW VH-2		
	Lithologic Unit Depths in Drill Hole	USGS OFR 85-475
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW WT-1		
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197

DATA CURRENTLY AVAILABLE ORGANIZED BY DRILL HOLE

HOLE	TYPE OF DATA	REFERENCE CITATION
USW WT-10		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW WT-11		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW WT-2		
	Mineralogical Samples and Test Conditions	LA-11497-MS
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
USW WT-7		
	Water Elevations and Depths, Dates of Measurements	USGS WRIR 84-4197
	Bulk Density Values and Test Conditions	SAND88-0811
	Bulk Modulus Data and Test Conditions	SAND86-1131
	Compressive Strength Data and Test Conditions	SAND86-1131
	Elastic Properties (Poisson's Ratio & Young's Modulus)	SAND86-1131
	Parameters for Measured Floods	USGS WRIR 83-4001
	Cross Section Locations for Predicted Floods	USGS WRIR 83-4001
	Flood Predictions (100 yr, 500 yr & Regional Maximum)	USGS WRIR 83-4001
	Grain Density Values and Test Conditions	SAND88-0811
	Lithologic Unit Depths in Drill Hole	SAND89-2270
	Mineralogical Samples and Test Conditions	SAND86-1131 SAND88-0882 USGS OFR 84-491
	Permeability and Test Conditions	SAND89-2270
	Paleomagnetic Data and Test Conditions	USGS OFR 85-48
	Porosity Values and Test Conditions	SAND88-0811 SAND89-2270
	Location Coordinates for Surface Samples	SAND86-1131 SAND88-0811 SAND89-2270 USGS OFR 84-491 USGS OFR 85-48
	Water Chemical Values for Springs & Non-Drill Hole Wells	USGS WRIR 84-4267

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

Bulk Density Values and Test Conditions:

J-13	USGS WRIR 83-4171
UE-25a #1	SAND88-0811
	USGS OFR 81-1338
UE-25b #1	USGS WRIR 84-4253
USW G-1	SAND87-2380
	SAND88-0811
	UCLR-53602
	UCLR-53645
USW G-2	SAND88-0811
USW G-3	USGS OFR 84-552
USW G-4	SAND87-2380
	SAND88-0811
	UCLR-53795
	USGS OFR 84-552
USW GU-3	SAND87-2380
	SAND88-0811
	USGS OFR 84-552
USW H-1	USGS WRIR 84-4032
	USGS WRIR 84-4193
non-core samples	SAND88-0811

Bulk Modulus Data and Test Conditions:

non-core samples	SAND86-1131

Compressive Strength Data and Test Conditions:

USW G-2	SAND85-0703
non-core samples	SAND86-1131

Saturation Curve-Fit Parameters and Test Conditions:

USW G-1	SAND87-2380
USW G-4	SAND87-2380
USW GU-3	SAND87-2380

Elastic Properties (Poisson's Ratio & Young's Modulus):

USW G-2	SAND85-0703
non-core samples	SAND86-1131

Parameters for Measured Floods:

non-core samples	USGS WRIR 83-4001

Cross Section Locations for Predicted Floods:

non-core samples	USGS WRIR 83-4001

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

Flood Predictions (100 yr, 500 yr & Regional Maximum) & Locations:

non-core samples	USGS WRIR 83-4001

Grain Density Values and Test Conditions:

J-13	USGS WRIR 83-4171
UE-25a #1	SAND88-0811
	USGS OFR 81-1338
UE-25b #1	USGS WRIR 84-4253
USW G-1	SAND88-0811
	UCLR-53645
USW G-2	SAND88-0811
USW G-3	USGS OFR 84-552
USW G-4	SAND88-0811
	UCLR-53795
	USGS OFR 84-552
USW GU-3	SAND88-0811
	USGS OFR 84-552
USW H-1	USGS WRIR 84-4032
	USGS WRIR 84-4193
non-core samples	SAND88-0811

Hydraulic Conductivity Values and Test Conditions:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS WRIR 84-4253
USW G-1	SAND87-2380
USW G-4	SAND87-2380
USW GU-3	SAND87-2380
USW H-1	USGS WRIR 84-4032

Lithologic Unit Depths in Drill Hole:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS WRIR 84-4253
UE-25p #1	USGS OFR 84-450
	USGS OFR 86-175
USW G-1	USGS OFR 81-1349
USW G-2	USGS OFR 83-732
USW G-3	USGS OFR 84-491
USW G-4	USGS OFR 84-063
USW GU-3	USGS OFR 84-491
USW H-1	USGS WRIR 84-4032
USW H-3	USGS WRIR 84-4272
USW H-4	USGS WRIR 85-4030
USW H-5	USGS OFR 83-853
USW VH-1	USGS OFR 82-457
USW VH-2	USGS OFR 85-475
non-core samples	SAND89-2270

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

Matrix Potential Data and Test Conditions:

USW G-1	SAND87-2380
USW G-4	SAND87-2380
USW GU-3	SAND87-2380
USW H-1	USGS WRIR 84-4193

Mineralogical Samples and Test Conditions:

J-12	LA-11497-MS
J-13	LA-11497-MS
UE-25a #1	LA-11497-MS
	SAND88-0882
	USGS OFR 84-491
UE-25b #1	LA-11497-MS
	USGS BULL-1777
UE-25p #1	LA-11497-MS
USW G-1	LA-11497-MS
	SAND88-0882
	USGS BULL-1777
	USGS OFR 81-1349
	USGS OFR 84-491
USW G-2	LA-11497-MS
	SAND88-0882
	USGS BULL-1777
	USGS OFR 83-732
	USGS OFR 84-491
USW G-3	USGS OFR 84-491
USW G-4	LA-10927-MS
	LA-11497-MS
	SAND88-0882
	USGS BULL-1777
	USGS OFR 84-789
USW GU-3	LA-11497-MS
	SAND88-0882
	USGS OFR 84-491
USW H-3	LA-11497-MS
USW H-4	LA-11497-MS
USW H-5	LA-11497-MS
USW H-6	LA-11497-MS
USW WT-1	LA-11497-MS
USW WT-2	LA-11497-MS
non-core samples	SAND86-1131
	SAND88-0882
	USGS OFR 84-491

Permeability and Test Conditions:

non-core samples	SAND89-2270

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

Percent Water Production in Drill Hole Intervals:

USW H-4	USGS WRIR 85-4030

Paleomagnetic Data and Test Conditions:

USW GU-3	USGS OFR 85-48
non-core samples	USGS OFR 85-48

Pore Saturation and Test Conditions:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS WRIR 84-4253
USW H-1	USGS WRIR 84-4032

Natural-state Porewater Content Percentages:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS OFR 83-855
	USGS WRIR 84-4253
USW H-1	USGS WRIR 84-4032

Porosity Values and Test Conditions:

J-13	USGS WRIR 83-4171
UE-25a #1	SAND88-0811
	USGS OFR 81-1338
UE-25b #1	USGS WRIR 84-4253
USW G-1	SAND88-0811
	UCLR-53602
	UCLR-53645
USW G-2	SAND88-0811
USW G-3	USGS OFR 84-552
USW G-4	SAND88-0811
	UCLR-53795
	USGS OFR 84-552
USW GU-3	SAND88-0811
	USGS OFR 84-552
USW H-1	USGS WRIR 84-4032
	USGS WRIR 84-4193
non-core samples	SAND88-0811
	SAND89-2270

Relative Hydraulic Conductivity & Test Conditions:

USW H-1	USGS WRIR 84-4193

Location Coordinates for Surface Samples:

non-core samples	SAND86-1131
	SAND88-0811
	SAND89-2270
	USGS OFR 84-491

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

	USGS OFR 85-48

Laboratory Sonic Velocity Measurements:

J-13	USGS WRIR 83-4171
UE-25a #1	USGS OFR 81-1338
USW G-3	USGS OFR 84-552
USW G-4	USGS OFR 84-552
USW GU-3	USGS OFR 84-552

Water Chemical Values for Springs & Non-Drill Hole Wells:

non-core samples	USGS WRIR 84-4267

Storage Coefficient Values for Well Tests:

USW H-1	USGS WRIR 84-4032
USW H-3	USGS WRIR 84-4272

Thermal Conductivity Data and Test Conditions:

USW G-1	SAND88-0624
USW G-2	SAND88-0624
USW G-4	SAND88-0624
USW GU-3	SAND88-0624

Thermal/Mechanical Stratigraphic Units:

UE-25a #1	SAND84-1076
UE-25a #4	SAND84-1076
UE-25a #5	SAND84-1076
UE-25a #6	SAND84-1076
UE-25a #7	SAND84-1076
UE-25b #1	SAND84-1076
USW G-1	SAND84-1076
USW G-2	SAND84-1076
USW G-4	SAND84-1076
USW GU-3	SAND84-1076
USW H-1	SAND84-1076
USW H-3	SAND84-1076
USW H-4	SAND84-1076
USW H-5	SAND84-1076
USW H-6	SAND84-1076

Transmissivity Data and Pumping Conditions:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS WRIR 84-4253
UE-25p #1	USGS WRIR 84-4248
USW G-4	USGS WRIR 86-4015
USW H-1	USGS WRIR 84-4032
USW H-3	USGS WRIR 84-4272
USW H-4	USGS WRIR 85-4030

DATA CURRENTLY AVAILABLE SEPDB ORGANIZED BY PARAMETER

Well Test Hydraulic Conductivity Measurements:

J-13	USGS WRIR 83-4171
UE-25b #1	USGS WRIR 84-4253
USW G-4	USGS WRIR 86-4015
USW H-1	USGS WRIR 84-4032
USW H-3	USGS WRIR 84-4272
USW H-4	USGS WRIR 85-4030

Water Elevations and Depths, Dates of Measurements:

J-11	USGS WRIR 84-4197
J-12	USGS WRIR 84-4197
J-13	USGS WRIR 84-4197
UE-16d	USGS 1543-3
UE-16f	USGS 1543-3
UE-25 WT #12	USGS WRIR 84-4197
UE-25 WT #13	USGS WRIR 84-4197
UE-25 WT #14	USGS WRIR 84-4197
UE-25 WT #15	USGS WRIR 84-4197
UE-25 WT #16	USGS WRIR 84-4197
UE-25 WT #17	USGS WRIR 84-4197
UE-25 WT #3	USGS WRIR 84-4197
UE-25 WT #4	USGS WRIR 84-4197
UE-25 WT #6	USGS WRIR 84-4197
UE-25b #1	USGS WRIR 84-4197
	USGS WRIR 84-4253
UE-25c #1	USGS WRIR 84-4197
UE-25p #1	USGS OFR 84-450
	USGS WRIR 84-4197
	USGS WRIR 84-4248
UE-29a #1	USGS OFR 84-142
UE-29a #2	USGS OFR 84-142
USW G-1	USGS WRIR 84-4197
USW G-2	USGS WRIR 84-4197
USW G-3	USGS WRIR 84-4197
USW G-4	USGS OFR 84-063
	USGS WRIR 84-4197
USW H-1	USGS WRIR 84-4032
	USGS WRIR 84-4197
USW H-3	USGS WRIR 84-4197
USW H-4	USGS WRIR 84-4197
	USGS WRIR 85-4030
USW H-5	USGS OFR 83-853
	USGS WRIR 83-4171
	USGS WRIR 84-4197
USW H-6	USGS OFR 83-856
	USGS WRIR 84-4197
USW VH-1	USGS WRIR 84-4197
USW VH-2	USGS WRIR 84-4197
USW WT-1	USGS WRIR 84-4197
USW WT-10	USGS WRIR 84-4197
USW WT-11	USGS WRIR 84-4197

USW WT-2	USGS WRIR 84-4197
USW WT-7	USGS WRIR 84-4197

Water Chemical Constituent Values for Drill Holes:

J-12	USGS OFR 85-484
J-13	USGS OFR 85-484
	USGS WRIR 83-4171
UE-16d	USGS 1543-3
UE-16f	USGS 1543-3
UE-17a	USGS 1543-4
UE-25b #1	USGS OFR 83-855
	USGS OFR 85-484
	USGS WRIR 84-4253
	USGS WRIR 84-4267
UE-25c #1	USGS OFR 85-484
UE-25c #2	USGS OFR 85-484
UE-25c #3	USGS OFR 85-484
UE-25p #1	USGS OFR 85-484
	USGS WRIR 84-4248
UE-29a #1	USGS OFR 84-142
UE-29a #2	USGS OFR 84-142
	USGS OFR 85-484
	USGS WRIR 84-4267
USW G-4	USGS OFR 84-063
	USGS OFR 85-484
USW H-1	USGS WRIR 84-4032
	USGS WRIR 84-4267
USW H-3	USGS OFR 85-484
USW H-4	USGS OFR 85-484
	USGS WRIR 85-4030
USW H-5	USGS OFR 83-853
	USGS OFR 85-484
USW H-6	USGS OFR 83-856
	USGS OFR 85-484
USW VH-1	USGS OFR 85-484
	USGS WRIR 84-4267
	USGS WRIR 86-4359

DATA CURRENTLY AVAILABLE FOR NON-CORE SAMPLES

TYPE OF DATA	REFERENCE CITATION
Bulk Density Values and Test Conditions	SAND88-0811
Bulk Modulus Data and Test Conditions	SAND86-1131
Compressive Strength Data and Test Conditions	SAND86-1131
Elastic Properties (Poisson's Ratio & Young's Modulus)	SAND86-1131
Parameters for Measured Floods	USGS WRIR 83-4001
Cross Section Locations for Predicted Floods	USGS WRIR 83-4001
Flood Predictions (100 yr, 500 yr & Regional Maximum) & Locations	USGS WRIR 83-4001
Grain Density Values and Test Conditions	SAND88-0811
Lithologic Unit Depths in Drill Hole	SAND89-2270
Mineralogical Samples and Test Conditions	SAND86-1131 SAND88-0882 USGS OFR 84-491
Permeability and Test Conditions	SAND89-2270
Paleomagnetic Data and Test Conditions	USGS OFR 85-48
Porosity Values and Test Conditions	SAND88-0811 SAND89-2270
Location Coordinates for Surface Samples	SAND86-1131 SAND88-0811 SAND89-2270 USGS OFR 84-491 USGS OFR 85-48
Water Chemical Values for Springs & Non-Drill Hole Wells	USGS WRIR 84-4267

DRILL HOLES FOR WHICH COORDINATES ARE AVAILABLE

USW Holes	UE Holes	Seismic Holes	Other Holes
* USW ES-1	UE-16d	U-25 Seismic #1	J-11
* USW ES-2	UE-16f	U-25 Seismic #10	J-12
USW G-1	UE-17a	U-25 Seismic #11	J-13
USW G-2	* UE-25 G-5	U-25 Seismic #12	PS CAROLYN
USW G-3	UE-25 RF #1	U-25 Seismic #13	PS SANDY
USW G-4	UE-25 RF #10	U-25 Seismic #14	* Test Hole #1
USW GA-1	UE-25 RF #11	U-25 Seismic #15	* Test Hole #10
USW GU-3	UE-25 RF #2	U-25 Seismic #16	* Test Hole #11
* USW GX	UE-25 RF #3	U-25 Seismic #17	* Test Hole #12
* USW GY	UE-25 RF #3B	U-25 Seismic #18	* Test Hole #13
USW H-1	UE-25 RF #4	U-25 Seismic #19	* Test Hole #14
USW H-3	UE-25 RF #5	U-25 Seismic #2	* Test Hole #15
USW H-4	* UE-25 RF #6	U-25 Seismic #20	* Test Hole #2
USW H-5	UE-25 RF #7	U-25 Seismic #21	* Test Hole #3
USW H-6	UE-25 RF #7A	U-25 Seismic #22	* Test Hole #4
* USW H-WEST	UE-25 RF #8	U-25 Seismic #23	* Test Hole #5
USW SP 5A	UE-25 RF #9	U-25 Seismic #24	* Test Hole #6
USW SP 5B	UE-25 TC #1	U-25 Seismic #3	* Test Hole #7
USW UZ-1	UE-25 TC #2	U-25 Seismic #4	* Test Hole #8
USW UZ-13	UE-25 TC #3	U-25 Seismic #5	* Test Pit #1
* USW UZ-2	UE-25 TC #4	U-25 Seismic #6	* Test Pit #2
* USW UZ-3	UE-25 TCi #1	U-25 Seismic #7	* Test Pit #3
* USW UZ-4	UE-25 TCi #2	U-25 Seismic #8	* Test Pit #6
* USW UZ-5	UE-25 TCi #3	U-25 Seismic #9	
USW UZ-6	UE-25 TCi #4	U-26 Seismic #1	
* USW UZ-6a	UE-25 UZ #4	U-29 Seismic #1	
USW UZ-6s	UE-25 UZ #5	U-30 Seismic #1	
USW UZ-7	UE-25 UZN #1	U-30 Seismic #2	
USW UZ-8	UE-25 UZN #10	U-5 Seismic #1	
* USW UZ-N1	UE-25 UZN #12	U-5 Seismic #2	
USW UZ-N24	UE-25 UZN #13	US-25 Seismic #1	
USW UZ-N25	UE-25 UZN #14	US-25 Seismic #10	
USW UZ-N26	UE-25 UZN #18	US-25 Seismic #11	
* USW UZ-N3	UE-25 UZN #19	US-25 Seismic #12	
USW UZ-N40	UE-25 UZN #2	US-25 Seismic #13	
USW UZ-N41	UE-25 UZN #20	US-25 Seismic #14	
USW UZ-N42	UE-25 UZN #21	US-25 Seismic #15	
USW UZ-N43	UE-25 UZN #22	US-25 Seismic #16	
USW UZ-N44	UE-25 UZN #23	US-25 Seismic #17	
USW UZ-N45	UE-25 UZN #28	US-25 Seismic #18	
USW UZ-N46	UE-25 UZN #29	US-25 Seismic #19	
USW UZ-N47	UE-25 UZN #3	US-25 Seismic #2	
USW UZ-N48	UE-25 UZN #30	US-25 Seismic #20	
USW UZ-N49	UE-25 UZN #4	US-25 Seismic #21	
USW UZ-N50	UE-25 UZN #5	US-25 Seismic #3	
USW UZ-N51	UE-25 UZN #56	US-25 Seismic #4	
USW UZ-N52	UE-25 UZN #6	US-25 Seismic #5	
USW UZ-N65	UE-25 UZN #60	US-25 Seismic #6	
USW UZ-N66	UE-25 UZN #7	US-25 Seismic #7	

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* Layout Drill-hole

DRILL HOLES FOR WHICH COORDINATES ARE AVAILABLE

USW Holes	UE Holes	Seismic Holes	Other Holes
USW UZ-N67	UE-25 UZN #8	US-25 Seismic #8	
USW UZ-N68	UE-25 UZN #85	US-25 Seismic #9	
USW UZ-N69	UE-25 UZN #9		
USW UZ-N70	UE-25 UZN #97		
USW UZ-N71	UE-25 UZNC #1		
USW UZ-N72	UE-25 UZNC #2		
USW UZ-N73	UE-25 WT #12		
USW UZ-N74	UE-25 WT #13		
USW UZ-N75	UE-25 WT #14		
USW UZ-N76	UE-25 WT #15		
USW UZ-N77	UE-25 WT #16		
USW UZ-N78	UE-25 WT #17		
USW UZ-N79	UE-25 WT #18		
USW UZ-N80	* UE-25 WT #19		
USW UZ-N81	* UE-25 WT #20		
USW UZ-N82	UE-25 WT #3		
USW UZ-N83	UE-25 WT #4		
USW UZ-N84	UE-25 WT #5		
USW UZ-N86	UE-25 WT #6		
USW UZ-N87	UE-25a #1		
USW UZ-N88	* UE-25a #2		
USW UZ-N89	UE-25a #3		
USW UZ-N90	UE-25a #4		
USW UZ-N93	UE-25a #5		
USW UZ-N94	UE-25a #6		
USW UZ-N95	UE-25a #7		
USW UZ-N96	UE-25b #1		
USW UZ-N98	* UE-25b #2		
* USW UZ4N-2	UE-25c #1		
* USW UZ4N-4	UE-25c #2		
* USW UZ4N-5	UE-25c #3		
USW VH-1	UE-25h #1		
USW VH-2	UE-25p #1		
* USW VH-3	* UE-25pa #1A		
USW WT-1	* UE-25pa #1B		
USW WT-10	UE-29 UZN #91		
USW WT-11	UE-29 UZN #92		
USW WT-2	UE-29a #1		
* USW WT-21	UE-29a #2		
* USW WT-22			
USW WT-7			
* USW WT-8			
* USW WT-9			

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* Layout Drill-hole

DRILL HOLES FOR WHICH BOTTOM HOLE INFORMATION IS AVAILABLE
(Bottom Hole Coordinates, Depth)

USW Holes	UE Holes	Seismic Holes	Other Holes
USW G-1	UE-16d	U-25 Seismic #1	
USW G-2	UE-16f	U-25 Seismic #10	
USW G-3	UE-17a	U-25 Seismic #11	
USW G-4	UE-25 RF #1	U-25 Seismic #12	
USW GA-1	UE-25 RF #10	U-25 Seismic #13	
USW GU-3	UE-25 RF #11	U-25 Seismic #14	
USW H-1	UE-25 RF #2	U-25 Seismic #15	
USW H-3	UE-25 RF #3	U-25 Seismic #16	
USW H-4	UE-25 RF #3B	U-25 Seismic #17	
USW H-5	UE-25 RF #4	U-25 Seismic #18	
USW H-6	UE-25 RF #5	U-25 Seismic #19	
USW UZ-1	UE-25 RF #7	U-25 Seismic #2	
USW UZ-13	UE-25 RF #7A	U-25 Seismic #20	
USW UZ-6	UE-25 RF #8	U-25 Seismic #21	
USW UZ-6s	UE-25 RF #9	U-25 Seismic #22	
USW UZ-7	UE-25 UZ #4	U-25 Seismic #23	
USW UZ-8	UE-25 UZ #5	U-25 Seismic #24	
USW UZ-N24	UE-25 UZN #1	U-25 Seismic #3	
USW UZ-N25	UE-25 UZN #10	U-25 Seismic #4	
USW UZ-N26	UE-25 UZN #12	U-25 Seismic #5	
USW UZ-N40	UE-25 UZN #13	U-25 Seismic #6	
USW UZ-N41	UE-25 UZN #14	U-25 Seismic #7	
USW UZ-N42	UE-25 UZN #18	U-25 Seismic #8	
USW UZ-N43	UE-25 UZN #19	U-25 Seismic #9	
USW UZ-N44	UE-25 UZN #2	U-26 Seismic #1	
USW UZ-N45	UE-25 UZN #20	U-29 Seismic #1	
USW UZ-N46	UE-25 UZN #21	U-30 Seismic #1	
USW UZ-N47	UE-25 UZN #22	U-30 Seismic #2	
USW UZ-N48	UE-25 UZN #23	U-5 Seismic #1	
USW UZ-N49	UE-25 UZN #28	U-5 Seismic #2	
USW UZ-N50	UE-25 UZN #29	US-25 Seismic #1	
USW UZ-N51	UE-25 UZN #3	US-25 Seismic #10	
USW UZ-N52	UE-25 UZN #30	US-25 Seismic #11	
USW UZ-N65	UE-25 UZN #4	US-25 Seismic #12	
USW UZ-N66	UE-25 UZN #5	US-25 Seismic #13	
USW UZ-N67	UE-25 UZN #56	US-25 Seismic #14	
USW UZ-N68	UE-25 UZN #6	US-25 Seismic #15	
USW UZ-N69	UE-25 UZN #60	US-25 Seismic #16	
USW UZ-N70	UE-25 UZN #7	US-25 Seismic #17	
USW UZ-N71	UE-25 UZN #8	US-25 Seismic #18	
USW UZ-N72	UE-25 UZN #85	US-25 Seismic #19	
USW UZ-N73	UE-25 UZN #9	US-25 Seismic #2	
USW UZ-N74	UE-25 UZN #97	US-25 Seismic #20	
USW UZ-N75	UE-25 UZNC #1	US-25 Seismic #21	
USW UZ-N76	UE-25 UZNC #2	US-25 Seismic #3	
USW UZ-N77	UE-25 WT #12	US-25 Seismic #4	
USW UZ-N78	UE-25 WT #13	US-25 Seismic #5	
USW UZ-N79	UE-25 WT #14	US-25 Seismic #6	
USW UZ-N80	UE-25 WT #15	US-25 Seismic #7	
USW UZ-N81	UE-25 WT #16	US-25 Seismic #8	

DRILL HOLES FOR WHICH BOTTOM HOLE INFORMATION IS AVAILABLE
(Bottom Hole Coordinates, Depth)

USW Holes	UE Holes	Seismic Holes	Other Holes
USW UZ-N82	UE-25 WT #17	US-25 Seismic #9	
USW UZ-N83	UE-25 WT #18		
USW UZ-N84	UE-25 WT #3		
USW UZ-N86	UE-25 WT #4		
USW UZ-N87	UE-25 WT #5		
USW UZ-N88	UE-25 WT #6		
USW UZ-N89	UE-25a #1		
USW UZ-N90	UE-25a #3		
USW UZ-N93	UE-25a #4		
USW UZ-N94	UE-25a #5		
USW UZ-N95	UE-25a #6		
USW UZ-N96	UE-25a #7		
USW UZ-N98	UE-25b #1		
USW VH-1	UE-25c #1		
USW VH-2	UE-25c #2		
USW WT-1	UE-25c #3		
USW WT-10	UE-25h #1		
USW WT-11	UE-25p #1		
USW WT-2	UE-29 UZN #91		
USW WT-7	UE-29 UZN #92		
	UE-29a #1		
	UE-29a #2		

DRILL HOLES FOR WHICH CORE INFORMATION IS AVAILABLE

(CORE INTERVALS, PERCENT AND RECOVERY DATA)

USW Holes	UE Holes	Seismic Holes	Other Holes
USW G-1	UE-25 RF #1		
USW G-2	UE-25 RF #10		
USW G-3	UE-25 RF #11		
USW G-4	UE-25 RF #2		
USW GA-1	UE-25 RF #3		
USW GU-3	UE-25 RF #3B		
USW H-1	UE-25 RF #4		
USW H-3	UE-25 RF #5		
USW H-4	UE-25 RF #7		
USW H-5	UE-25 RF #7A		
USW H-6	UE-25 RF #8		
USW UZ-1	UE-25 RF #9		
USW UZ-13	UE-25 UZ #4		
USW UZ-6	UE-25 UZ #5		
USW UZ-6s	UE-25 UZN #1		
USW UZ-7	UE-25 UZN #10		
USW UZ-8	UE-25 UZN #19		
USW UZ-N24	UE-25 UZN #21		
USW UZ-N25	UE-25 UZN #22		
USW UZ-N26	UE-25 UZN #23		
USW UZ-N40	UE-25 UZN #28		
USW UZ-N41	UE-25 UZN #29		
USW UZ-N42	UE-25 UZN #30		
USW UZ-N43	UE-25 UZN #85		
USW UZ-N44	UE-25 UZN #97		
USW UZ-N45	UE-25 WT #12		
USW UZ-N46	UE-25 WT #13		
USW UZ-N47	UE-25 WT #14		
USW UZ-N48	UE-25 WT #15		
USW UZ-N49	UE-25 WT #16		
USW UZ-N70	UE-25 WT #18		
USW UZ-N74	UE-25 WT #3		
USW UZ-N75	UE-25 WT #4		
USW UZ-N90	UE-25 WT #6		
USW UZ-N98	UE-25a #4		
USW VH-1	UE-25a #5		
USW VH-2	UE-25a #6		
USW WT-1	UE-25a #7		
USW WT-10	UE-25b #1		
USW WT-11	UE-25c #1		
USW WT-2	UE-25c #2		
USW WT-7	UE-25c #3		
	UE-25h #1		
	UE-25p #1		
	UE-29 UZN #91		
	UE-29 UZN #92		
	UE-29a #1		
	UE-29a #2		

HOLE HISTORIES SUBMITTED TO THE SEPDB

NNWSI Hole Histories UE-25 WT #3, UE-25 WT #4, UE-25 WT #5, UE-25 WT #6, UE-25 WT #12, UE-25 WT #13, UE-25 WT #14, UE-25 WT #15, UE-25 WT #16, UE-25 WT #17, UE-25 WT #18, USW WT-1, USW WT-2, USW WT-7, USW WT-10, USW WT-11, DOE/NV/10322-10

NNWSI Hole Histories UE-25 RF #1, UE-25 RF #2, UE-25 RF #3, UE-25 RF #3B, UE-25 RF #4, UE-25 RF #5, UE-25 RF #7, UE-25 RF #7A, UE-25 RF #8, UE-25 RF #9, UE-25 RF #10, UE-25 RF #11, DOE/NV/10322-11

NNWSI Hole Histories UE-29a #1, UE-29a #2, DOE/NV/10322-12

NNWSI Hole History UE-25b #1, DOE/NV/10322-13

NNWSI Hole Histories UE-25c #1, UE-25c #2, UE-25c #3, DOE/NV/10322-14

NNWSI Hole History UE-25h #1, DOE/NV/10322-15

NNWSI Hole History UE-25p #1, DOE/NV/10322-16

NNWSI Hole Histories USW VH-1, USW VH-2, DOE/NV/10322-17

NNWSI Hole Histories USW H-1, USW H-3, USW H-4, USW H-5, USW H-6, DOE/NV/10322-18

NNWSI Hole Histories USW G-1, USW G-2, USW G-3, USW G-4, USW GA-1, USW GU-3, DOE/NV/10322-19

NNWSI Hole Histories USW UZ-1, UE-25 UZ#4, UE-25 UZ #5, USW UZ-6, USW US-6s, USW UZ-7, USW UZ-8, USW UZ-13, DOE/NV/10322-20

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NNWSI 51 Seismic Hole Histories, DOE/NV/10322-25

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APPENDIX B

BULK DENSITY

TABLE DESCRIPTION: Bulk Density Values and Test Conditions

PARAMETERS
- Bulk density value for the sample
- Unit of measure for bulk density data (g/cm**3)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Sample mass and units of measure of sample tested
- Saturation state of sample during test

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

BULK MODULUS

TABLE DESCRIPTION: Bulk Modulus Data and Test Conditions

PARAMETERS
- Numerical value for bulk modulus
- Unit of measure for bulk modulus data (GPa, ...)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample length and units of measure of sample tested
- Confining pressure of sample during test
- Sample diameter and units of measure of sample tested
- Drainage condition of sample during test
- Pore pressure conditions of sample during test
- Saturation state of sample during test
- Strain rate during test (per sec,...)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

BOTTOM HOLE COORDINATES

TABLE DESCRIPTION: Nevada Plane Coordinates for Bottom of Surveyed Drill Holes

PARAMETERS
- Total depth of hole in feet
- Total vertical depth of hole in feet (will be <= total depth)

LOCATION INFORMATION
- Nevada state-plane coordinates for bottom of hole or sample (measured in feet)
- Nevada state-plane coordinates for bottom of hole or sample (measured in feet)

TEST CONDITIONS
- Date of survey
- Bottom hole survey type

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document

COMPRESSIVE STRENGTH

TABLE DESCRIPTION: Compressive Strength Data and Test Conditions

PARAMETERS
- Numerical value for compressive strength
- Unit of measure for compressive strength data (MPa,)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Confining pressure of sample during test
- Pore pressure conditions of sample during test
- Drainage condition of sample during test
- Axial strain at which sample failed
- Unit of measure for axial strain data (milli, ...)
- Strain rate during test (per sec,...)
- Saturation state of sample during test

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

CORE INFORMATION

TABLE DESCRIPTION: Core Information, Intervals and Percent Recovery

PARAMETERS
- Length of cored interval
- Units for cored, recovered, and interval fields
- Percent of recovered core to cored length (%)
- Length of actual recovery of core in interval

LOCATION INFORMATION
- Drill hole name for the data
- Location of top of cored interval (measured in feet)
- Location of bottom of core interval (measured in feet)

TEST CONDITIONS
- Identification number for section of core

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

CURVE FIT

TABLE DESCRIPTION: Saturation Curve-Fit Parameters and Test Conditions

PARAMETERS
- van Genuchten curve-fit parameter, alpha
- Unit of measure for alpha data (per meter, ...)
- Standard error for alpha
- van Genuchten curve-fit parameter, beta
- Standard error for beta
- Residual saturation of sample
- Standard error for residual saturation

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Number of points in sample
- Analysis method used to determine parameter value

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

ELASTIC PROPERTIES

TABLE DESCRIPTION: Elastic Properties (Poisson's Ratio & Young's Modulus)

PARAMETERS
- Poisson's ratio for the sample (no units)
- Numerical value for Young's modulus
- Unit of measure for Youngs Modulus data (GPa, lb/sq ft, ..)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Confining pressure of sample during test
- Pore pressure conditions of sample during test
- Drainage condition of sample during test
- Axial strain at which sample failed
- Unit of measure for axial strain data (/sec)
- Strain rate during test (per sec,...)
- Saturation state of sample during test

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

MEASURED FLOODS

TABLE DESCRIPTION: Parameters for Measured Floods

PARAMETERS
- Maximum discharge of water
- Unit of measure for maximum discharge data (ex. cfs for cubic feet per second)

LOCATION INFORMATION
- Location of flood event measurement
- Latitude of x_section (ex. 36 deg 3 min)
- Longitude of x_section (ex. 116 deg 24 min)

TEST CONDITIONS
- Date of actual flood event
- Range in altitude of drainage basin, usually the feet above sea level (ex. 3000 - 6080 ft)
- Drainage basin area above location
- Unit of measure for drainarea (ex. mi**2 for square miles)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

FLOOD PREDICTIONS

TABLE DESCRIPTION: Flood Predictions (100 yr, 500 yr & Regional Maximum) & Locations

PARAMETERS
- Estimated peak discharge
- Unit of measure for estimated peak discharge data (ex. cfs for cubic feet per second)
- Mean velocity of flood event (ex. 7.2 ft/sec

LOCATION INFORMATION
- Unique name for each cross-section location
- Name of river bed or wash
- Latitude of x_section (ex. 36 deg 3 min)
- Longitude of x_section (ex. 116 deg 24 min)
- Mean elevation of contributing drainage basin

TEST CONDITIONS
- Type of flood (100 yr, 500 yr, regional max, ...)
- Cross-sectional area below water surface (ex. 11,000 sq. ft)
- Cross-sectional distance between channel banks at water surface (ex. 1,530 ft)
- Vertical distance from water surface to deepest point in cross-section (ex. 4.1 ft)
- Contributing drainage basin area above cross-section (ex. 256 mi**2 for square miles)
- Analysis method for calculating predictions (ex. fortymile wash study, statewide relations, SCS method, 482 x (drainarea**0.565), 2200 x (drainarea**0.571), Crippen & Bue boundary curve, ...)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

GRAIN DENSITY

TABLE DESCRIPTION: Grain Density Values and Test Conditions

PARAMETERS
- Grain Density value for the sample
- Unit of measure for grain density data (g/cm**3)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Sample mass and units of measure of sample tested

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

DRILL HOLE COORDINATES

TABLE DESCRIPTION: Drill Hole Locations, Surveys and Status

LOCATION INFORMATION
- Drill hole name for the data
- Nevada state-plane coordinates for top of hole (measured in feet)
- Nevada state-plane coordinates for top of hole (measured in feet)
- Elevation above sea level of drill-hole
- Elevation at top of casing (measured in feet)

TEST CONDITIONS
- Date of survey
- Status of drillhole's construction

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document

HYDRAULIC CONDUCTIVITY

TABLE DESCRIPTION: Hydraulic Conductivity Values and Test Conditions

PARAMETERS
- Hydraulic Conductivity for the sample
- Unit of measure for hydraulic conductivity data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test id if multiple tests on the same interval or sample were taken
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Direction of measurement (horizontal, vertical)
- Sample pressure and units of measure during test
- Confining pressure of sample during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

LITHOLOGIC UNITS

TABLE DESCRIPTION: Lithologic Unit Depths in Drill Hole

PARAMETERS

- Stratigraphic unit name or rock type with the name of the stratigraphic unit above it for the interval described (ex. Bedded Tuff below Prow Pass Member)
- Depth in hole to top of lithologic-unit interval
- Depth in hole to bottom of lithologic-unit interval
- Unit of measure for the interval (ft or m)

LOCATION INFORMATION

- Drill hole name for the data
- Sample identification number

SEPDB TRACKING INFORMATION

- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

MATRIX POTENTIAL

TABLE DESCRIPTION: Matrix Potential Data and Test Conditions

PARAMETERS
- Matric Potential Value for the sample
- Unit of measure for matric potential data
- Range of the amount, such as >, <, trace or interval top, if amount is given as a range of values, for the matricpot value

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Sample temperature and units of measure during test
- Test number of multiple tests on the same interval or sample
- Sample pressure and units of measure during test
- Testing method used to determine parameter value
- Quantity of water present in the voids
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Unit of measure for quantity of water present in voids - (d for dimensionless)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

MINERALOGY

TABLE DESCRIPTION: Mineralogical Samples and Test Conditions

PARAMETERS
- Name of the mineral, oxide or constituent reported
- Numerical amount of the constituent
- Unit that constituent is reported in (%)
- Uncertainty in reported data value

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole to top of mineralogy_unit interval
- Depth in hole to bottom of mineralogy_unit interval
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Type of analysis
- Cross-reference to the comments in the mineralsmp table
- Testing method used to determine parameter value
- Type of material tested (mineral, whole rock, ...)
- Comments on material or various tests

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

PERMEABILITY

TABLE DESCRIPTION: Permeability and Test Conditions

PARAMETERS
- Permeability of the sample
- Unit of measure for permeability data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test id if multiple tests on the same interval or sample were taken
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Direction of measurement (horizontal, vertical)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

WATER PRODUCTION

TABLE DESCRIPTION: Percent Water Production in Drill Hole Intervals

PARAMETERS
- Percent water production value for the interval
- Unit of measure for percent water production data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Top of depth interval which measurement represents
- Bottom of depth interval which measurement represents
- Unit of measure for the interval (ft or m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Date measurement was performed
- Amount of deviation from best fit of test analysis
- Amount of water pumped for the test
- Rate at which water was pumped from the test well

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

PALEOMAGNETIC

TABLE DESCRIPTION: Paleomagnetic Data and Test Conditions

PARAMETERS
- Average declination of remanence (water reference mark)
- Numerical value for intensity of remanence
- Average inclination of remanence (water reference mark)
- Inclination of remanence relative to reference mark
- Unit of measure for the average declination and inclination data (degrees, ...)
- Unit of measure for the intensity data (Amp/m, ...)
- Declination of remanence relative to reference mark
- Unit of measure for the declination and inclination data (degrees, ...)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Declination of the reference mark
- Test number of multiple tests on the same interval or sample
- Alternating field demagnetization prior to test
- Paleomagnetic orientation of the reference mark
- Half angle of the cone of 95% confidence
- Alternating field demagnetization levels used
- Fisher precision parameter
- Testing method used to determine parameter value

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

PORE SATURATION

TABLE DESCRIPTION: Pore Saturation and Test Conditions

PARAMETERS
- Value for the natural state pore saturation of the sample
- Unit of measure for the pore saturation data (%)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

PORE WATER CONTENT

TABLE DESCRIPTION: Natural-state Porewater Content Percentages

PARAMETERS
- Natural-state water content for total sample
- Unit of measure for the natural state water content data (cc/cc, vol %, wt %)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

POROSITY

TABLE DESCRIPTION: Porosity Values and Test Conditions

PARAMETERS
- Porosity value for the sample
- Unit of measure for porosity data (%,)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Sample mass and units of measure of sample tested

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

RELATIVE HYDRAULIC CONDUCTIVITY

TABLE DESCRIPTION: Relative Hydraulic Conductivity & Test Conditions

PARAMETERS
- Relative Hydraulic Conductivity Value for the sample
- Unit of measure for relative hydraulic conductivity data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Direction of measurement (horizontal, vertical)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

SAMPLE LOCATIONS

TABLE DESCRIPTION: Location Coordinates for Surface Samples

LOCATION INFORMATION
- Sample identification number
- Location of sample
- Nevada State Plane Coordinates (easting) (measured in feet)
- Nevada State Plane Coordinates (northing) (measured in feet)
- Altitude above sea level of the sample
- Unit of measure for the altitude (ft, m or gl for ground level)

TEST CONDITIONS
- Date sample was taken
- Method of obtaining the sample's location

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal in which the sample was first reported.

SONIC VELOCITY

TABLE DESCRIPTION: Laboratory Sonic Velocity Measurements

PARAMETERS
- Sonic Velocity Value for the sample
- Unit of measure for sonic velocity data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample pressure and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Direction of measurement (horizontal, vertical)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

SPRING WATER CHEMISTRY

TABLE DESCRIPTION: Water Chemical Values for Springs & Non-Drill Hole Wells

PARAMETERS
- Name of the chemical constituent being reported
- Numerical amount of the constituent
- Unit that chemical constituent data (mg/l, mcrS/cm)

LOCATION INFORMATION
- Spring or location name for the data
- Location of spring or non-drill hole well
- Either the depth interval which sample represents or 'surface'

TEST CONDITIONS
- Comments related to reported constituent or units
- Date water sample was collected
- Testing method used to determine parameter value
- Spring temperature at time sample was collected
- Discharge rate of spring at time sample was collected
- Water-bearing rock zone for the spring
- Altitude above sea level of the spring or non-drill hole well
- Unit of measure for the altitude (ft, m)

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

STORAGE COEFFICIENT

TABLE DESCRIPTION: Storage Coefficient Values for Well Tests

PARAMETERS
- Storage coefficient value for the interval (unitless)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Top of depth interval which measurement represents
- Bottom of depth interval which measurement represents
- Unit of measure for the interval (ft or m)

TEST CONDITIONS
- Testing method used to determine parameter value
- Method of analysis for storage coefficient value

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

THERMAL CONDUCTIVITY

TABLE DESCRIPTION: Thermal Conductivity Data and Test Conditions

PARAMETERS
- Numerical value for thermal conductivity
- Unit of measure for thermal conductivity data (W/mK, ..)

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Depth in hole from which sample originates
- Unit of measure for depth (ft, m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Sample temperature and units of measure during test
- Sample length and units of measure of sample tested
- Sample diameter and units of measure of sample tested
- Pore pressure conditions of sample during test
- Pore fluid used for sample saturation
- Confining pressure of sample during test
- Saturation state of sample during test

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

TABLE DESCRIPTION: Thermal/Mechanical Stratigraphic Units

PARAMETERS

- Stratigraphic unit name or rock type with the name of the stratigraphic unit above it for the interval described (ex. UO, TCw, PTn)
- Depth in hole to top of thermal/mechanical stratigraphic-unit interval
- Depth in hole to bottom of thermal/mechanical stratigraphic-unit interval
- Unit of measure for the interval (ft or m)

LOCATION INFORMATION

- Drill hole name for the data

SEPDB TRACKING INFORMATION

- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

TRANSMISSIVITY

TABLE DESCRIPTION: Transmissivity Data and Pumping Conditions

PARAMETERS
- Transmissivity value for the interval
- Unit of measure for transmissivity data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Top of depth interval which measurement represents
- Bottom of depth interval which measurement represents
- Unit of measure for the interval (ft or m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Method of analysis for transmissivity value
- Test episode if several tests are grouped into episodes
- Date water sample was collected
- Rate at which water was pumped from the test well
- Amount of water pumped for the test
- Amount of deviation from best fit of test analysis

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

WELL HYDRAULIC CONDUCTIVITY

TABLE DESCRIPTION: Well Test Hydraulic Conductivity Measurements

PARAMETERS
- Well test hydraulic conductivity value for the interval
- Unit of measure for the well hydraulic conductivity data

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Top of depth interval which measurement represents
- Bottom of depth interval which measurement represents
- Unit of measure for the interval (ft or m)

TEST CONDITIONS
- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Method of analysis for conductivity value
- Test episode if several tests are grouped into episodes
- Date water sample was collected
- Rate at which water was pumped from the test well
- Amount of water pumped for the test

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

WATER LEVEL

TABLE DESCRIPTION: Water Elevations and Depths, Dates of Measurements

PARAMETERS

- Date of water level measurement
- Value used to correct down-hole run to true run
- Depth to water, true vertical if depth correction is specified. If surface altitude is given depth is depth of water below land surface.
- Altitude of water surface above sea level
- Depth of drill hole from which samples orginated
- Altitude of land surface at the well
- Unit of measure for sample

LOCATION INFORMATION

- Drill hole name for the data
- Sample identification number
- Top of interval that the level represents
- Bottom of interval that the level represents
- Source of the land-surface altitude

TEST CONDITIONS

- Test number of multiple tests on the same interval or sample
- Testing method used to determine parameter value
- Measurement access for reported value (i.e., composite, tube 1, upper, lower)

SEPDB TRACKING INFORMATION

- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

DRILL HOLE WATER CHEMISTRY

TABLE DESCRIPTION: Water Chemical Constituent Values for Drill Holes

PARAMETERS
- Name of the chemical constituent or physical property
- Numerical amount or value of the constituent or physical property
- Unit of measure for the constituents (mg/l, pCu/l)
- Uncertainty in reported data value

LOCATION INFORMATION
- Drill hole name for the data
- Sample identification number
- Top of depth interval which sample represents
- Bottom of depth interval which sample represents
- Depth in hole from which sample originates
- Unit of measure for the interval (ft or m)

TEST CONDITIONS
- Cross-reference to the comments in the wtrsumm table
- Date water sample was collected
- Testing method used to determine parameter value
- Type of analysis
- Sample temperature and units of measure during test
- Quantity of water pumped before sample was taken
- Well interval temperature when sample was collected
- Length of pre-sample pumping in units of time
- Discharge rate of pre-sample pumping

SEPDB TRACKING INFORMATION
- QA level of the data-gathering activity under approved YMP/QAPP (QA or NQ). TBD indicates no QAPP was in place.
- Data authorization number assigned each TPO data submittal
- Page number where summary information appears in reference document
- Page number where value appears in reference document
- Specifies location of reference in participant's data archive (PDA)

APPENDIX C

EXAMPLE OF SEPDB DATA COMPILATION

THERMAL EXPANSION EXPERIMENTS DATA COMPILATION FORM FOR THE YMP SEPDB

PART 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID Perp. A SAMPLE ORIGIN UE-25e#1

SAMPLE DEPTH (ft) 185.0 TEST NO. 1

PART 2. PARAMETERS

HEATING CURVE DATA

TEMPERATURE RANGE DURING HEATING	°C	25-50	50-100	100-150	150-200	200-250	250-300
	°F	77-122	122-212	212-302	302-392	392-482	482-572
LINEAR THERMAL EXPANSION COEFFICIENT DURING HEATING ($10^{-6}°C^{-1}$)a		8.8	8.6	13.6	16.6	20.6	N/C
ESTIMATED EXPERIMENTAL UNCERTAINTY ($10^{-6}°C^{-1}$)a		N/D	N/D	N/D	N/D	N/D	N/A
PORE PRESSURE (MPa)		0.1	0.1	0.1	0.1	0.1	N/A

COOLING CURVE DATA

TEMPERATURE RANGE DURING COOLING	°C	300-250	250-200	200-150	150-100	100-50	50-25
	°F	572-482	482-392	392-302	302-212	212-122	122-77
LINEAR THERMAL EXPANSION COEFFICIENT DURING COOLING ($10^{-6}°C^{-1}$)a		N/C	N/C	N/C	N/C	N/C	N/C
ESTIMATED EXPERIMENTAL UNCERTAINTY ($10^{-6}°C^{-1}$)a		N/A	N/A	N/A	N/A	N/A	N/A
PORE PRESSURE (MPa)		N/A	N/A	N/A	N/A	N/A	N/A

PART 3. EXPERIMENT CONDITIONS

EXPERIMENT TECHNIQUE Dual Push Rod Dilatometer

SAMPLE LENGTH (cm)	SAMPLE DIA (cm)	SAMPLE WIDTH (cm)	SAMPLE THICKNESS (cm)	FRITTEST SAMPLE MASS (g)	FORTTEST SAMPLE MASS (g)
2.55	N/A	0.5	0.5	N/D	N/D

HEATING RATE (°C/min)	COOLING RATE (°C/min)	TYPE OF ATMOSPHERE	DRAINED OR UNDRAINED	CONFINING PRESSURE (MPa)	INITIAL SAMPLE SATURATION	TYPE OF PORE FLUID
1	N/D	Air	Undrained	0.1	Natural-state	N/A

PART 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY TBD SNL YMP DATA-SET ID 91/LO1B-2/1/76

SNL DATA REPORT NUMBER SAND91-1991

THIS DCF COMPLETED BY Barry Schwartz (Name) 6313 (SNL Div.) 1/23/91 (Date)

a. To obtain thermal expansion coefficients in units of $10^{-6}°y^{-1}$, multiply by 0.6.

COMMENTS

N/A = not applicable, N/C = not compiled, N/D = no data available, TBD = to be determined.

Run #113.

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

WORK REQUEST

YMP SITE & ENGINEERING PROPERTIES DATA BASE (SEPDB)

Send to:
SEPDB Data Base Administrator
Sandia National Laboratories
Technical Projects Division, 6316
P. O. Box 5800
Albuquerque, NM 87185
Telephone: (505 or FTS) 846-0304 or 846-8178

Request Number: 252
Date Received: 5/24/91
Product QA Level: N
Data QA Level: 1 D

TO BE COMPLETED BY REQUESTOR:

Name: Stephen J Bauer Signature: Stephen J Bauer

Organization: SNL - 6313 Date: 5/24/91

Address: SNL Telephone: 846 3647

Work Requested - Attach additional explanations, sketches, and example listing, if appropriate:

Requested Data QA Level: 1) A

uniaxial and triaxial strength data with elastic properties

For all tests at Yucca Mtn

please provide test conditions, sample descriptions - depth, hole ID etc

also any other information such as porosity.

TO BE COMPLETED BY DATA BASE PERSONNEL

Type: Data Entry ____ Product Request ✓ Other ____

Accepted By: Diane Lipton Date: 5/24/91
Assigned To: [illegible] Date: 5/24/91
Verified By: Gary Lipton Date: 6/7/91
Approved By: Gary Lipton Date: 6/7/91

Product Numbers, or Accession Numbers:

SEP0093

File - 6310 41/12131/1.4/NQ Number of attachments: 0

WORK:1/90

DEPTH (ft)	CE SAMPLE ID	COMPRESSIVE STRENGTH (MPa)	(C) AXIAL STRENGTH (millis)	POISSONS RATIO	YOUNG'S MODULUS (GPa)	(E) AXIAL STRENGTH (millis)	PHD SAMPLE ID	POROSITY (%)	DRY BULK DENSITY (g/cm**3)	SATURATED BULK DENSITY (g/cm**3)	NATURAL BULK DENSITY (g/cm**3)	GRAIN DENSITY (g/cm**3)	GEOLOGIC STRATIGRAPHY	THERMAL-MECHANICAL UNIT
797.00	G2-797.0-1	143.0	2.7	0.20	57.1	2.7	1	2.00	2.350	2.370	-	2.400	TSW	TSw1
797.00	G2-797.0-2	125.0	2.2	0.21	50.0	2.2	2	4.00	2.330	2.370	-	2.430	TSW	TSw1
797.00	G2-797.0-A	162.0	3.0	0.23	63.5	3.0	A	4.00	2.340	2.380	-	2.440	TSW	TSw1
797.00	G2-797.0-B	150.0	2.6	0.26	59.6	2.6	B	2.00	2.360	2.390	-	2.430	TSW	TSw1
810.40	G2-810.4-A	160.0	2.9	0.24	57.0	2.9	A	2.00	2.360	2.390	-	2.430	TSW	TSw1
940.40	G2-940.4-C	157.0	2.9	0.26	49.0	2.9		-	-	-	-	-	TSW	TSw1
940.40	G2-940.4-A	167.0	4.6	0.30	62.0	4.6	A	0.00	2.310	2.390	-	2.310	TSW	TSw1
940.40	G2-940.4-B	115.0	2.0	0.26	41.9	2.0	B	10.00	2.200	2.300	-	2.530	TSW	TSw1
940.40	G2-940.4-D	117.0	2.2	0.26	42.1	2.2	D	8.00	2.290	2.370	-	2.490	TSW	TSw1
949.60	G2-949.6-C	220.0	6.2	0.19	80.6	6.2	C	7.00	2.300	2.370	-	2.470	TSW	TSw1
969.00	G2-969.0-A	190.0	3.6	-	68.9	3.6	A	7.00	2.330	2.400	-	2.510	TSW	TSw1
969.00	G2-969.0-B	210.0	4.0	0.21	46.3	4.0	B	0.00	2.310	2.390	-	2.310	TSW	TSw1
969.00	G2-969.0-D	157.0	3.1	0.24	56.7	3.1	D	0.00	2.300	2.380	-	2.300	TSW	TSw1
1297.60	G2-1297.6-A	9.0	1.4	-	-	-	A	22.00	1.940	2.160	-	2.490	TSW	TSw1
1297.60	G2-1297.6-B	7.0	2.4	-	-	-	B	24.00	1.900	2.140	-	2.500	TSW	TSw1
1325.30		-	-	-	-	-		11.46	2.240	-	2.530	2.530	TSW	TSw2
1330.00		-	-	-	-	-		16.21	2.120	-	2.200	2.530	TSW	TSw2
1361.30	G2-1361.3-A	85.0	4.7	0.11	22.1	4.7	A	10.00	2.240	2.340	-	2.490	TSW	TSw2
1361.30	G2-1361.3-C	73.0	4.1	0.17	22.0	4.1	C	10.00	2.260	2.360	-	2.510	TSW	TSw2
1361.30	G2-1361.3-D	84.0	4.1	-	22.7	4.1	D	10.00	2.260	2.360	-	2.510	TSW	TSw2
1361.30	G2-1361.3-E	81.0	3.7	-	23.6	3.7	E	12.00	2.210	2.330	-	2.250	TSW	TSw2
1379.10	G2-1379.1-A	170.0	5.6	0.17	39.9	5.6	A	9.00	2.300	2.390	-	2.530	TSW	TSw2
1379.10	G2-1379.1-C	97.0	6.3	0.18	28.8	6.3	C	14.00	2.150	2.270	-	2.500	TSW	TSw2
1379.10	G2-1379.1-D	173.0	6.1	0.17	31.8	6.1	D	9.00	2.280	2.370	-	2.510	TSW	TSw2
1379.10	G2-1379.1-E	96.0	5.0	0.19	30.5	5.0	E	12.00	2.230	2.350	-	2.530	TSW	TSw2
1560.40		-	-	-	-	-	24	19.10	2.304	2.284	-	2.602	TSW	TSw2
1582.60		-	-	-	-	-	25	11.60	2.294	2.390	-	2.596	TSW	TSw2
1587.00	G2-1587.0-B	165.0	6.1	0.20	35.9	6.1	B	9.00	2.300	2.390	-	2.530	TSW	TSw2
1587.00	G2-1587.0-D	155.0	5.5	0.26	35.5	5.5	D	7.00	2.330	2.400	-	2.510	TSW	TSw2
1600.00		-	-	-	-	-	26	16.70	2.187	2.270	-	2.520	TSW	TSw2
1600.70		-	-	-	-	-	27B	15.20	2.156	2.304	-	2.542	TSW	TSw2
1600.70		-	-	-	-	-	27A	14.20	2.191	2.224	-	2.553	TSW	TSw2
1619.90		-	-	-	-	-	28	11.10	2.301	2.402	-	2.587	TSW	TSw2
1624.10		-	-	-	-	-	29	11.10	2.236	2.319	-	2.515	TSW	TSw2
1628.50		-	-	-	-	-	30	16.00	2.206	2.333	-	2.627	TSW	TSw2
1646.00	G2-1646.0-B	32.0	3.0	-	-	-		-	-	-	-	-	TSW	TSw2
1646.00	G2-1646.0-C	27.0	3.0	-	-	-		-	-	-	-	-	TSW	TSw2
1659.20	G2-1659.2-B	33.0	4.6	-	-	-		-	-	-	-	-	TSW	TSw2
1659.20	G2-1659.2-A	60.0	5.1	-	-	-	A	4.00	2.270	2.310	-	2.360	TSW	TSw2
1723.03	G2-1723.03-A	22.0	3.9	0.24	6.3	3.9		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1723.03	G2-1723.03-C	29.0	4.0	0.10	8.5	4.0		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1740.00	G2-1740.0-A	20.0	2.5	0.10	14.2	2.5		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1740.00	G2-1740.0-B	27.0	2.2	-	11.2	2.2		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1740.00	G2-1740.0-C	25.0	2.4	0.22	11.0	2.4		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1740.00	G2-1740.0-E	23.0	2.3	0.23	11.2	2.3		-	-	-	-	-	Bedded Tuff below TSW	CHnlv
1740.00	G2-1740.0-F	20.0	4.0	0.11	11.1	4.0		-	-	-	-	-	Bedded Tuff below TSW	CHnlv

NOTES: CE SAMPLE ID are the sample identifications associated with the compressive strength, poissons ratio and young's modulus fields.
PHD SAMPLE ID are the sample identifications associated with the porosity, bulk density and grain density fields.
(C) AXIAL STRENGTH is the axial strength for compressive strength. (E) AXIAL STRENGTH is the axial strength for poissons ratio and young's modulus.
- indicates no data was submitted. TSW in Geologic Stratigraphy field stands for Topopah Spring Member.

SUPPORTING COMPRESSIVE STRENGTH DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0008
SUBMITTAL CITATION NUMBER: SAND85-0703
SUBMITTAL TITLE: Uniaxial and Triaxial Compression Test Series on the Topopah Spring Member from USW G-2, Yucca Mountain, Nevada
DATA QA LEVEL: HQ

DEPTH (ft)	SAMPLE ID	COMPRESSIVE STRENGTH (MPa)	AXIAL STRENGTH (milli)	CONFINING PRESSURE	STRAIN RATE DURING TEST	SAMPLE LENGTH	SAMPLE DIAMETER	PAGE NO	LOCAL RECORD CENTER NUMBER
797.00	G2-797.0-1	143.0	3.7	0	1e-05 /sec	101.7 mm	50.8 mm	9,17	51/L82-3/30/84
797.00	G2-797.0-2	125.0	3.2	0	1e-05 /sec	101.7 mm	50.9 mm	9,17	51/L82-3/30/84
797.00	G2-797.0-A	142.0	3.8	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
797.00	G2-797.0-B	138.0	3.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
818.40	G2-818.4-A	168.0	5.3	0	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L82-3/30/84
948.40	G2-948.4-A	167.0	4.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
948.40	G2-948.4-B	115.0	3.0	0	1e-07 /sec	50.8 mm	25.2 mm	9,17	51/L82-3/30/84
948.40	G2-948.4-C	157.0	3.3	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
948.40	G2-948.4-D	117.0	3.2	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
949.60	G2-949.6-C	220.0	6.2	0	1e-05 /sec	50.7 mm	25.3 mm	9,17	51/L82-3/30/84
969.00	G2-969.0-A	130.0	3.6	0	1e-05 /sec	50.8 mm	25	9,17	51/L82-3/30/84
969.00	G2-969.0-B	210.0	4.8	0	1e-05 /sec	50.8 mm	2	9,17	51/L82-3/30/84
969.00	G2-969.0-D	157.0	3.1	0	1e-05 /sec	101.7 mm	[illegible]	9,17	51/L82-3/30/84
1297.60	G2-1297.6-A	3.0	1.4	0	1e-05 /sec	50.8 mm	25.2 mm	9,17	51/L82-3/30/84
1297.60	G2-1297.6-B	7.0	2.4	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1361.30	G2-1361.3-A	85.0	4.7	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1361.30	G2-1361.3-C	73.0	4.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1361.30	G2-1361.3-D	86.0	4.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1361.30	G2-1361.3-E	61.0	3.7	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1379.10	G2-1379.1-A	170.0	5.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1379.10	G2-1379.1-C	97.0	6.3	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1379.10	G2-1379.1-D	175.0	6.1	0	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L82-3/30/84
1379.10	G2-1379.1-E	96.0	5.8	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1387.80	G2-1387.8-B	165.0	6.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1387.80	G2-1387.8-D	135.0	5.5	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1646.80	G2-1646.8-B	32.0	3.0	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1646.80	G2-1646.8-C	37.0	5.0	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1659.20	G2-1659.2-A	60.0	5.3	10	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1659.20	G2-1659.2-B	53.0	4.6	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1725.05	G2-1725.05-A	22.0	3.9	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1725.05	G2-1725.05-C	29.0	4.8	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1748.00	G2-1748.0-A	28.0	3.5	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1748.00	G2-1748.0-C	23.0	3.4	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1748.00	G2-1748.0-D	27.0	3.2	0	1e-07 /sec	50.9 mm	25.3 mm	9,17	51/L82-3/30/84
1748.00	G2-1748.0-E	35.0	3.5	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84
1748.00	G2-1748.0-F	28.0	4.3	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L82-3/30/84

NOTE: The following are global values for the entire report:
TEST TYPE: constant strain rate
TEST TEMPERATURE: ambient
PORE PRESSURE: ambient
DRAINAGE CONDITION: drained

June 6, 1991

SEPDB PRODUCT NUMBER: SEP0093

SUPPORTING ELASTIC PROPERTIES DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0008
SUBMITTAL CITATION NUMBER: SAND92-0793
SUBMITTAL TITLE: Uniaxial and Triaxial Compression Test Series on the Topopah Spring Member from USW G-2, Yucca Mountain, Nevada
DATA QA LEVEL: SQ

DEPTH (ft)	SAMPLE ID	YOUNG'S MODULUS (GPa)	POISSONS RATIO	AXIAL STRENGTH (millii)	STRAIN RATE DURING TEST	SAMPLE LENGTH	SAMPLE DIAMETER	PAGE NO	LOCAL RECORD CENTER NUMBER
797.00	G2-797.0-1	37.1	0.20	2.7	1e-05 /sec	101.7 mm	50.8 mm	9,17	91/L02-3/30/84
797.00	G2-797.0-2	39.9	0.21	3.2	1e-05 /sec	101.7 mm	50.9 mm	9,17	91/L02-3/30/84
797.00	G2-797.0-A	43.5	0.25	3.8	1e-05 /sec	50.9 mm	25.3 mm	9,17	91/L02-3/30/84
797.00	G2-797.0-B	39.4	0.26	3.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
810.40	G2-810.4-A	37.8	0.24	3.3	1e-05 /sec	50.9 mm	25.2 mm	9,17	91/L02-3/30/84
948.40	G2-948.4-A	42.0	0.30	4.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
948.40	G2-948.4-B	41.9	0.26	3.8	1e-07 /sec	50.8 mm	25.2 mm	9,17	91/L02-3/30/84
948.40	G2-948.4-C	49.0	0.26	3.3	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
948.40	G2-948.4-D	42.1	0.26	3.2	1e-07 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
949.60	G2-949.6-C	38.6	0.19	6.2	1e-05 /sec	50.7 mm	25.2 mm	9,17	91/L02-3/30/84
969.00	G2-969.0-A	40.2	-	2.4	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
969.00	G2-969.0-B	46.3	0.21	4.8	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
969.00	G2-969.0-D	34.7	0.24	3.1	1e-05 /sec	101.7 mm	50.9 mm	9,17	91/L02-3/30/84
1561.30	G2-1561.3-A	22.1	0.11	4.7	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1561.30	G2-1561.3-C	22.0	0.17	4.1	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1561.30	G2-1561.3-D	22.7	-	4.1	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1561.30	G2-1561.3-E	23.6	-	3.7	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1579.10	G2-1579.1-A	33.9	0.17	5.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1579.10	G2-1579.1-C	18.8	0.10	6.3	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1579.10	G2-1579.1-D	31.8	0.17	6.1	1e-05 /sec	50.9 mm	25.2 mm	9,17	91/L02-3/30/84
1579.10	G2-1579.1-E	29.5	0.19	5.8	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1587.00	G2-1587.0-B	35.9	0.20	6.1	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1587.00	G2-1587.0-D	35.5	0.16	5.5	1e-05 /sec	50.9 mm	25.3 mm	9,17	91/L02-3/30/84
1725.05	G2-1725.05-A	6.8	0.24	3.9	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1725.05	G2-1725.05-C	8.5	0.18	4.8	1e-05 /sec	50.9 mm	25.3 mm	9,17	91/L02-3/30/84
1748.00	G2-1748.0-A	14.2	0.18	2.9	1e-07 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1748.00	G2-1748.0-C	11.6	0.22	3.4	1e-05 /sec	50.9 mm	25.3 mm	9,17	91/L02-3/30/84
1748.00	G2-1748.0-D	11.2	-	3.2	1e-07 /sec	50.9 mm	25.3 mm	9,17	91/L02-3/30/84
1748.00	G2-1748.0-E	11.2	0.23	3.5	1e-05 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84
1748.00	G2-1748.0-F	11.1	0.11	4.8	1e-07 /sec	50.8 mm	25.3 mm	9,17	91/L02-3/30/84

NOTE: The following are global values for the entire report:
TEST TYPE: constant strain rate
TEST TEMPERATURE: ambient
CONFINING PRESSURE: 0
PORE PRESSURE: ambient
DRAINAGE CONDITION: drained
SATURATION STATE: saturated

SUPPORTING POROSITY DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0042
SUBMITTAL CITATION NUMBER: SAND88-0811
SUBMITTAL TITLE: Density and Porosity Data for Tuffs from the Unsaturated Zone at Yucca Mountain, Nevada
DATA QA LEVEL: TBD

DEPTH (ft)	SAMPLE ID	POROSITY (%)	TEST TYPE	TEST TEMPERATURE	TEST PRESSURE	PAGE NO	LOCAL RECORD CENTER NUMBER
797.0	1		matrix, 100(SSD-DRD)/MD	ambient	ambient	C-4	51/L02-3/30/84
797.0	2	4.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-4	51/L02-3/30/84
797.0	A	4.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-3	51/L03-3/30/84
797.0	B	5.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-3	51/L02-3/30/84
818.4	A	5.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-5	51/L02-3/30/84
948.4	A	8.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-5	51/L02-3/30/84
948.4	B	10.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-6	51/L02-3/30/84
948.4	D	8.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-6	51/L02-3/30/84
949.6	C	7.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-7	51/L02-3/30/84
949.8	A	7.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-7	51/L02-3/30/84
949.8	B	8.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-8	51/L02-3/30/84
949.8	D	8.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-8	51/L02-3/30/84
1297.6	A	23.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-9	51/L02-3/30/84
1297.6	B	24.00	matrix, 100(SSD-DRD)/MB	ambient	ambient	C-9	51/L02-3/30/84
1326.3		11.46	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-10	51/L03-9/7/82
1339.0		16.21	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-10	51/L03-9/7/82
1341.3	A	10.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-11	51/L02-3/30/84
1341.3	C	10.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-11	51/L02-3/30/84
1341.3	D	10.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-12	51/L02-3/30/84
1341.3	E	12.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-12	51/L02-3/30/84
1379.1	A	9.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-13	51/L02-3/30/84
1379.1	C	14.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-13	51/L02-3/30/84
1379.1	D	9.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-14	51/L02-3/30/84
1379.1	E	12.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-14	51/L02-3/30/84
1380.4	24	19.10	matrix, 1 /GD)]	ambient	ambient	C-15	51/L03-1/16/85
1382.6	25	11.40	matrix, 100[/GD)]	ambient	ambient	C-15	51/L03-1/16/85
1387.8	B	9.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-16	51/L02-3/30/84
1387.8	D	7.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-16	51/L02-3/30/84
1688.0	26	16.70	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-17	51/L03-1/16/85
1688.7	27A	14.20	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-17	51/L03-1/16/85
1688.7	27B	15.20	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-18	51/L03-1/16/85
1613.9	28	11.10	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-18	51/L03-1/16/85
1624.1	29	11.10	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-19	51/L03-1/16/85
1628.5	30	16.00	matrix, 100[1-(DRD/GD)]	ambient	ambient	C-19	51/L03-1/16/85
1639.2	A	6.00	matrix, 100(SSD-DRD)/MD	ambient	ambient	C-20	51/L02-3/30/84

NOTE: Sample Length, Sample Mass and Sample Diameter not given for USW G-2.

SUPPORTING BULK DENSITY DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0042
SUBMITTAL CITATION NUMBER: SAND92-0911
SUBMITTAL TITLE: Density and Porosity Data for Tuffs from the Unsaturated Zone at Yucca Mountain, Nevada
DATA QA LEVEL: TBD

DEPTH (ft)	SAMPLE ID	BULK DENSITY (g/cm**3)	SATURATION STATE	TEST TYPE	TEST TEMPERATURE	TEST PRESSURE	SAMPLE MASS	PAGE NO	LOCAL RECORD CENTER NUMBER
797.0	1	2.350	dry	caliper	ambient	ambient	403.69 g	C-4	91/L02-3/30/84
797.0	1	2.370	saturated	caliper	ambient	ambient	409.21 g	C-4	91/L02-3/30/84
797.0	2	2.330	dry	caliper	ambient	ambient	401.58 g	C-4	91/L02-3/30/84
797.0	2	2.370	saturated	caliper	ambient	ambient	409.03 g	C-4	91/L02-3/30/84
797.0	A	2.340	dry	caliper	ambient	ambient	39.67 g	C-5	91/L02-3/30/84
797.0	A	2.380	saturated	caliper	ambient	ambient	40.71 g	C-5	91/L02-3/30/84
797.0	B	2.360	dry	caliper	ambient	ambient	40.12 g	C-5	91/L02-3/30/84
797.0	B	2.390	saturated	caliper	ambient	ambient	40.87 g	C-5	91/L02-3/30/84
810.4	A	2.360	dry	caliper	ambient	ambient	39.89 g	C-5	91/L02-3/30/84
810.4	A	2.390	saturated	caliper	ambient	ambient	40.88 g	C-5	91/L02-3/30/84
940.4	A	2.310	dry	caliper	ambient	ambient	38.89 g	C-5	91/L02-3/30/84
940.4	A	2.390	saturated	caliper	ambient	ambient	40.84 g	C-5	91/L02-3/30/84
940.4	B	2.280	dry	caliper	ambient	ambient	37.90 g	C-6	91/L02-3/30/84
940.4	B	2.380	saturated	caliper	ambient	ambient	40.30 g	C-6	91/L02-3/30/84
940.4	D	2.290	dry	caliper	ambient	ambient	38.40 g	C-6	91/L02-3/30/84
940.4	D	2.370	saturated	caliper	ambient	ambient	40.41 g	C-6	91/L02-3/30/84
949.6	C	2.300	dry	caliper	ambient	ambient	38.53 g	C-7	91/L02-3/30/84
949.6	C	2.370	saturated	caliper	ambient	ambient	40.36 g	C-7	91/L02-3/30/84
969.0	A	2.330	dry	caliper	ambient	ambient	39.33 g	C-7	91/L02-3/30/84
969.0	A	2.400	saturated	caliper	ambient	ambient	41.10 g	C-7	91/L02-3/30/84
969.0	B	2.310	dry	caliper	ambient	ambient	38.84 g	C-8	91/L02-3/30/84
969.0	B	2.390	saturated	caliper	ambient	ambient	40.85 g	C-8	91/L02-3/30/84
969.0	D	2.300	dry	caliper	ambient	ambient	475.61 g	C-8	91/L02-3/30/84
969.0	D	2.380	saturated	caliper	ambient	ambient	492.02 g	C-8	91/L02-3/30/84
1297.6	A	1.940	dry	caliper	ambient	ambient	49.28 g	C-9	91/L02-3/30/84
1297.6	A	2.160	saturated	caliper	ambient	ambient	54.85 g	C-9	91/L02-3/30/84
1297.6	B	1.900	dry	caliper	ambient	ambient	48.66 g	C-9	91/L02-3/30/84
1297.6	B	2.140	saturated	caliper	ambient	ambient	54.76 g	C-9	91/L02-3/30/84
1526.3		2.240	dry	immersion	ambient	ambient	79.996 g	C-10	91/L03-9/7/92
1526.3		2.350	natural	immersion	ambient	ambient	77.620 g	C-10	91/L03-9/7/92
1559.0		2.120	dry	immersion	ambient	ambient	43.016 g	C-10	91/L03-9/7/92
1559.0		2.200	natural	immersion	ambient	ambient	46.268 g	C-10	91/L03-9/7/92
1561.3	A	2.240	dry	caliper	ambient	ambient	37.81 g	C-11	91/L02-3/30/84
1561.3	A	2.340	saturated	caliper	ambient	ambient	39.72 g	C-11	91/L02-3/30/84
1561.3	C	2.260	dry	caliper	ambient	ambient	37.39 g	C-11	91/L02-3/30/84
1561.3	C	2.360	saturated	caliper	ambient	ambient	40.12 g	C-11	91/L02-3/30/84
1561.3	D	2.260	dry	caliper	ambient	ambient	37.67 g	C-12	91/L02-3/30/84
1561.3	D	2.360	saturated	caliper	ambient	ambient	40.11 g	C-12	91/L02-3/30/84
1561.3	E	2.210	dry	caliper	ambient	ambient	36.70 g	C-12	91/L02-3/30/84
1561.3	E	2.330	saturated	caliper	ambient	ambient	39.63 g	C-12	91/L02-3/30/84
1579.1	A	2.300	dry	caliper	ambient	ambient	38.39 g	C-13	91/L02-3/30/84
1579.1	A	2.390	saturated	caliper	ambient	ambient	40.81 g	C-13	91/L02-3/30/84
1579.1	C	2.150	dry	caliper	ambient	ambient	33.15 g	C-13	91/L02-3/30/84

NOTE: Sample Length and Sample Diameter not given for USW G-2.

SUPPORTING BULK DENSITY DATA FOR DRILL HOLE MM G-2

SEPD693

DEPTH (ft.)	SAMPLE ID	BULK DENSITY (g/cm**3)	SATURATION STATE	TEST TYPE	TEST TEMPERATURE	TEST PRESSURE	SAMPLE MASS	PAGE NO	LOCAL RECORD CENTER NUMBER
1579.1	C	2.290	saturated	caliper	ambient	ambient	58.80 g	C-13	51/L82-3/30/84
1579.1	D	2.260	dry	caliper	ambient	ambient	57.88 g	C-14	51/L82-3/30/84
1579.1	D	2.370	saturated	caliper	ambient	ambient	60.19 g	C-14	51/L82-3/30/84
1579.1	E	2.230	dry	caliper	ambient	ambient	56.92 g	C-14	51/L82-3/30/84
1579.1	E	2.350	saturated	caliper	ambient	ambient	59.85 g	C-14	51/L82-3/30/84
1580.4	24	2.106	dry	immersion	ambient	ambient	47.662 g	C-15	51/L83-1/18/85
1580.4	24	2.284	saturated	immersion	ambient	ambient	51.847 g	C-15	51/L83-1/18/85
1582.6	25	2.294	dry	immersion	ambient	ambient	152.967 g	C-15	51/L83-1/18/85
1582.6	25	2.390	saturated	immersion	ambient	ambient	159.424 g	C-15	51/L83-1/18/85
1587.8	B	2.300	dry	caliper	ambient	ambient	58.70 g	C-16	51/L82-3/30/84
1587.8	B	2.390	saturated	caliper	ambient	ambient	60.80 g	C-16	51/L82-3/30/84
1587.8	D	2.230	dry	caliper	ambient	ambient	59.35 g	C-16	51/L82-3/30/84
1587.8	D	2.400	saturated	caliper	ambient	ambient	61.23 g	C-16	51/L82-3/30/84
1680.0	26	2.187	dry	immersion	ambient	ambient	161.117 g	C-17	51/L83-1/18/85
1680.0	26	2.270	saturated	immersion	ambient	ambient	173.575 g	C-17	51/L83-1/18/85
1680.7	27A	2.191	dry	immersion	ambient	ambient	70.089 g	C-17	51/L83-1/18/85
1680.7	27A	2.324	saturated	immersion	ambient	ambient	75.123 g	C-17	51/L83-1/18/85
1680.7	27B	2.156	dry	immersion	ambient	ambient	66.377 g	C-18	51/L83-1/18/85
1680.7	27B	2.304	saturated	immersion	ambient	ambient	70.914 g	C-18	51/L83-1/18/85
1613.9	28	2.301	dry	immersion	ambient	ambient	74.029 g	C-18	51/L83-1/18/85
1613.9	28	2.402	saturated	immersion	ambient	ambient	83.484 g	C-18	51/L83-1/18/85
1624.1	29	2.236	dry	immersion	ambient	ambient	109.724 g	C-19	51/L83-1/18/85
1624.1	29	2.319	saturated	immersion	ambient	ambient	113.799 g	C-19	51/L83-1/18/85
1626.5	30	2.286	dry	immersion	ambient	ambient	131.315 g	C-19	51/L83-1/18/85
1626.5	30	2.355	saturated	immersion	ambient	ambient	140.170 g	C-19	51/L83-1/18/85
1630.2	A	2.270	dry	caliper	ambient	ambient	57.76 g	C-20	51/L82-3/30/84
1630.2	A	2.310	saturated	caliper	ambient	ambient	58.83 g	C-20	51/L82-3/30/84

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

SUPPORTING GRAIN DENSITY DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0042
SUBMITTAL CITATION NUMBER: SAND90-0811
SUBMITTAL TITLE: Density and Porosity Data for Tuffs from the Unsaturated Zone at Yucca Mountain, Nevada
DATA QA LEVEL: TBD

DEPTH (ft)	SAMPLE ID	GRAIN DENSITY (g/cm**3)	TEST TYPE	TEST TEMPERATURE	TEST PRESSURE	SAMPLE MASS	PAGE NO	LOCAL RECORD CENTER NUMBER
797.0	1	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-4	91/L02-3/30/84
797.0	2	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-4	91/L02-3/30/84
797.0	A	2.440	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-5	91/L02-3/30/84
797.0	B	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-5	91/L02-3/30/84
810.4	A	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-5	91/L02-3/30/84
940.4	A	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-5	91/L02-3/30/84
940.4	B	2.550	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-6	91/L02-3/30/84
940.4	B	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-6	91/L02-3/30/84
949.6	C	2.470	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-7	91/L02-3/30/84
969.0	A	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-7	91/L02-3/30/84
969.0	B	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-8	91/L02-3/30/84
969.0	B	2.500	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-8	91/L02-3/30/84
1297.6	A	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-9	91/L02-3/30/84
1297.6	B	2.500	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-9	91/L02-3/30/84
1526.9		2.530	water pycnometer	ambient	ambient	44.672 g	C-10	91/L03-9/7/92
1539.0		2.590	water pycnometer	ambient	ambient	44.813 g	C-10	91/L03-9/7/92
1561.8	A	2.490	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-11	91/L02-3/30/84
1561.8	C	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-11	91/L02-3/30/84
1561.8	B	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-12	91/L02-3/30/84
1561.8	E	2.250	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-12	91/L02-3/30/84
1579.1	A	2.530	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-13	91/L02-3/30/84
1579.1	C	2.500	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-13	91/L02-3/30/84
1579.1	B	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-14	91/L02-3/30/84
1579.1	E	2.530	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-14	91/L02-3/30/84
1580.4	24	2.692	water pycnometer	ambient	ambient	26.398 g	C-15	91/L03-1/10/93
1582.6	25	2.594	water pycnometer	ambient	ambient	29.897 g	C-15	91/L03-1/10/93
1587.0	B	2.530	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-16	91/L02-3/30/84
1587.0	B	2.510	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-16	91/L02-3/30/84
1600.0	26	2.528	water pycnometer	ambient	ambient	29.131 g	C-17	91/L03-1/10/93
1600.7	27A	2.559	water pycnometer	ambient	ambient	26.809 g	C-17	91/L03-1/10/93
1600.7	27B	2.542	water pycnometer	ambient	ambient	27.194 g	C-18	91/L03-1/10/93
1613.9	28	2.587	water pycnometer	ambient	ambient	27.284 g	C-18	91/L03-1/10/93
1624.1	29	2.515	water pycnometer	ambient	ambient	28.031 g	C-19	91/L03-1/10/93
1628.5	30	2.627	water pycnometer	ambient	ambient	28.314 g	C-19	91/L03-1/10/93
1659.2	A	2.560	GD = DBD/(1 + DBD - BBD)	ambient	ambient		C-20	91/L02-3/30/84

NOTE: Sample Length and Sample Diameter not given for USW G-2.

BLANK WORK REQUEST FORM

WORK REQUEST

YMP SITE & ENGINEERING PROPERTIES DATA BASE (SEPDB)

Send to:
SEPDB Data Base Administrator
Sandia National Laboratories
Technical Projects Division, 6316
P. O. Box 5800
Albuquerque, NM 87185
Telephone: (505 or FTS) 846-0304 or 846-8178

Request Number: _____
Date Received: _____
Product QA Level: _____
Data QA Level: _____

TO BE COMPLETED BY REQUESTOR:

Name: _____ Signature: _____

Organization: _____ Date: _____

Address: _____ Telephone: _____

Work Requested - Attach additional explanations, sketches, and example listing, if appropriate:

Requested Data QA Level: _____

TO BE COMPLETED BY DATA BASE PERSONNEL

Type: Data Entry _____ Product Request _____ Other _____

Accepted By: _____ Date: _____
Assigned To: _____ Date: _____
Verified By: _____ Date: _____
Approved By: _____ Date: _____

Product Numbers, or Accession Numbers:

File - 6310 41/12131/1.4/

Number of attachments: _____

WORK:1/90

THE GEOGRAPHIC INFORMATION SYSTEM COMPONENT OF THE YMP TECHNICAL DATA BASE

(GENISES)

THE GEOGRAPHIC NODAL INFORMATION STUDY AND EVALUATION SYSTEM

QUARTERLY REPORT

BY
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TABLE OF CONTENTS

1.0 INTRODUCTION

The Geographic Information System (GIS) component of the Technical Data Base is under development by the Remote Sensing Laboratory (RSL) operated by EG&G Energy Measurements, Inc. (EG&G/EM). The purpose of the Geographic Nodal Information Study and Evaluation System (GENISES) is to provide a repository for technical data that are best characterized by spatial or geographic (map-oriented) features.

Chapter 2 describes the primary types of data currently held by EG&G/EM RSL and provides reference information on the sources of GENISES data. This information is presented in the form of two tables.

Chapter 3 discusses the significant activities during the previous quarter, including data added to the database, requested and delivered products, and the status of the EG&G/EM RSL YMP Support Office.

Chapter 4 describes major activities scheduled for the upcoming quarter, including plans for equipping the YMP Support Office, the development plan for the GENISES database, and design plans for the revised Site Atlas Map Portfolio.

The YMP GENISES Work Request form is provided in Appendix GENISES-A. This form is to be used when requesting information products from the GENISES database.

2.0 DATABASE CONTENTS

2.1 Types of Data Currently Held

As mentioned previously, GENISES contains spatial and geographic data associated with the Yucca Mountain site. These data are summarized in Table 2-1. This table has been organized to present data layer types or themes, listings of the types of attribute or descriptive data associated with each data layer, and an index number that indicates the reference or data source from which associated GENISES information was taken. This listing is not comprehensive; rather, it is intended to provide GENISES users with an understanding of the primary thematic data layers contained in the database.

As a result of re-issuing the Site Atlas, several locations of data were modified or additions made to the database. Coverages that were updated include the following: 13, 17, 18, 53, 65, and 73. Please refer to section 3.1 for a description of the changes.

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

ADMINISTRATIVE DATA

01 LAND OWNERSHIP (1:100,000 scale source data)

Land Status

02 POLITICAL AND ADMINISTRATIVE BOUNDARIES (1:2,000,000 scale source data; entire US digital database)

Political (national, state and country boundaries); Administrative (national parks, forests, wilderness areas, Indian and Military reservations).

03 POLITICAL AND ADMINISTRATIVE BOUNDARIES (1:100,000 scale source data; entire US digital database)

Political (national, state and county boundaries); Administrative (national parks, forests, wilderness areas, Indian and Military reservations).

04 POLITICAL AND ADMINISTRATIVE BOUNDARIES (1:24,000 scale source data)

Political (national, state and county boundaries); Administrative (national parks, forests, wilderness areas, Indian and Military reservations).

05 PUBLIC LAND SURVEY SYSTEM (PLSS)

Township, Range, Section

06 PUBLIC LAND SURVEY SYSTEM (PLSS) (1:24,000 scale source data)

Township, Range, Section

07 7.5' USGS TOPOGRAPHIC QUADRANGLE DLG AVAILABILITY INDEX

Name, USGS reference no., Year published, Year revised, contour interval, availability of: PLSS, boundaries, hydrography, hypsography, transportation, and DEM.

08 ORTHOPHOTO SHEETS INDEX MAP (1:6,000 scale source data)

Sheet number, scale, date of photography.

09 ORTHOPHOTO SHEETS INDEX MAP (1:12,000 scale source data)

Sheet number, scale, date of photography.

10 BLM LAND WITHDRAWAL BOUNDARY

Boundary, area, perimeter

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

11 GEOGRAPHIC NAMES INFORMATION SYSTEM (Entire US digital database)

Names found on USGS maps.

12 LODE MINING CLAIM (1:6,000 scale source data)

Boundary, area, perimeter, claim, ID.

13 DEMOGRAPHIC DATA (1:100,000 scale source data; entire US digital database)

Populated places, census tract, census block

INFRASTRUCTURE DATA

14 TRANSPORTATION FEATURES (1:2,000,000 scale source data; entire US digital database)

Roads and trails, railroads and airfields.

15 TRANSPORTATION FEATURES (1:100,000 scale source data; entire US digital database)

Roads and trails, railroads and airfields.

16 TRANSPORTATION FEATURES (1:24,000 scale source data)

Roads, trails, railroads, pipelines, transmission lines.

SITE CHARACTERIZATION ACTIVITIES

17 EXISTING ACTIVITIES

Activity ID, source, elevation, activity type, depth, core requirement, drainage

18 PROPOSED ACTIVITIES

Activity ID, source, elevation, activity type, depth, core requirement, year.

19 CONCEPTUAL CONTROLLED AREA BOUNDARY

Boundary, area, perimeter, name

20 CONCEPTUAL PERIMETER DRIFT

Boundary, area, perimeter, name

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

21 SUBSURFACE ACCESS DRIFTS AND RAMPS

Length

22 EXPLORATORY STUDIES FACILITIES (1:2,400 scale source map)

Facility Names

23 CORE AREA BOUNDARY

Boundary, area, perimeter, name

24 DISTURBANCE FEATURES

Roads, Pads, Other

PHYSIOGRAPHIC DATA

25 GEOFEATURES (1:250,000 scale source data)

Name

26 ELEVATION CONTOURS (1:2,400 scale source data; 2 foot interval)

isoline value

27 ELEVATION CONTOURS (1:6,000 scale source data; 10 foot interval)

isoline value

28 ELEVATION CONTOURS (1:24,000 scale source data; 20 foot interval)

isoline value

29 ELEVATION CONTOURS (1:40,000 scale source data; 40 foot interval)

isoline value

30 ELEVATION CONTOURS (1:5,000 scale source data; 2 meter interval)

isoline value

31 ELEVATION CONTOURS (1:100,000 scale source data; 50 meter interval)

isoline value

32 DIGITAL ELEVATION MODEL (DEM) (1:250,000 scale source data)

Surface elevation

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

33 DIGITAL ELEVATION MODEL (DEM) (1:24,000 scale source data)

Surface elevation

34 DIGITAL ELEVATION MODEL (DEM) (1:12,000 scale source data)

Surface elevation

35 DIGITAL ELEVATION MODEL (DEM) (1:6,000 scale source data)

Surface elevation

36 SEISMIC REFRACTION STUDIES

Length, ID, shot point locations,

37 SEISMIC REFLECTION STUDIES

Length, ID

38 GEOELECTRIC SURVEY AREAS

Area, type of survey

39 GEOELECTRIC TRAVERSES

Type of traverse, length, sounding locations

40 RESISTIVITY SOUNDINGS

Location

GEOLOGIC DATA

41 FAULTS (1:12,000 and 1:24,000 scale source data)

Locational certainty, fault movement

42 FRACTURES (1:12,000 and 1:24,000 scale source data)

Strike

43 FRACTURE SETS (1:12,000 and 1:24,000 scale source data)

Strike

44 TECTONIC BRECCIA (1:12,000 and 1:24,000 scale source data) Location

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

45 BEDROCK ALLUVIUM CONTACT (1:12,000 and 1:24,000 scale source data)

Bedrock/alluvium, area, perimeter

61 URANIUM SERIES DATING

Station ID

66 G-TUNNEL

Activity ID, Elevation

68 SEISMIC MONITORING STATIONS

Station #, Elevation

69 SEISMIC MONITORING NETWORK

Site Designator, Site Name

70 SEISMIC REFRACTION SHOTPOINT AND GEOPHONE

Shotpoint ID, Geophone ID

71 MAGNETIC AIR AND GROUIND TRAVERSES

Magnetic contours, traverse ID, traverse length, maxima, minima

72 MAGNETIC SURVEY

Magnetic contours, traverse ID, traverse length, maxima, minima

73 GRAVITY STATIONS

Station ID, Elevation

74 MAGNETOMETRIC RESISTIVITY SURVEY

ID, orientation

77 MAGNETOTELLURIC SURVEY DATA

Points, Station ID

HYDROGRAPHIC DATA

46 HYDROGRAPHY (1:2,000,000 scale source data; entire US digital database)

Streams, water bodies

47 HYDROGRAPHY (1:100,000 scale source data; entire US digital database)

Streams, water bodies

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

48 HYDROGRAPHY (1:24,000 scale source data)

Streams, water bodies

49 FLOOD PRONE AREAS (1:24,000 scale source data)

Limits of Inundation

50 FLOODPLAIN CROSS-SECTION (1:24,000 scale source data)

USGS Cross-section

51 DRAINAGE BASINS (1:24,000 scale source data)

Drainage Basin Divide

52 HYDROGRAPHIC REGIONS AND BASINS (1:750,000 scale source data)

Basins, subbasins

53 MONITORING SITES/STATIONS

Site identification, monitoring type, site ID, buffers

54 POTENTIOMETRIC CONTOURS

Isoline value

62 FOSSIL WOODRAT MIDDEN LOCALITIES

Elevation

63 PALEOCLIMATE TEMPERATURE AND PRECIPITATION

Station ID, Elevation

64 SPRINGS AND WELLS

Station ID, Elevation

65 GROUNDWATER RECHARGE MONITORING STATIONS

Activity ID, Elevation

67 GROUNDWATER OBSERVATION WELLS

Site ID, Elevation, Well Depth, Casing Diameter

TABLE 2-1 TYPES OF DATA CURRENTLY IN THE GENISES DATABASE

BIOLOGIC DATA

55 BIOLOGICAL STUDY AREAS

Area ID

56 DESERT TORTOISE TRANSECTS

Biology ID, study area, year, length, presence of sign

57 SMALL MAMMAL TRAPLINES

Trapline ID

58 PROPOSED LAGOMORPH TRANSECTS

Transect, length, ID

59 PROPOSED SCENT STATION ROUTES

Transect, length, ID

60 ECOLOGICAL SAMPLING PLOTS

Area, ID

76 RAVEN SURVEY ROUTES

Raven Survey Stop ID

INDEX MAPS

75 BEDROCK GEOLOGY, SURFACE GEOLOGY, AEROMAGNETIC SURVEYS, GRAVITY SURVEYS

Index map ID

2.2 Database References

GENISES information is available to YMP participating organizations and, on approval by the YMP Project Office, to outside parties. Access to or development of specific information products may be obtained by completing a YMP GENISES Work Request (see Appendix GENISES-A). Table 2-2 is a listing of GENISES reference citations. These citations identify GENISES information sources. New reference citations added since the publication of the last (July - December 1991) TDB Quarterly Report are indicated by an asterisk (*).

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

REF (**)	REFERENCE
01	U.S. Bureau of Land Management, 1978. "Surface Management Status Map", Beatty Quadrangle, Nevada-California, 1:100,000 Scale Series (Planimetric).
02	U.S. Geological Survey, National Mapping Program, 1970. "National Atlas of the United States of America", Digital Line Graphs at 1:2,000,000 scale.
03	U.S. Department of Commerce, Bureau of the Census, 1990. "Topologically Integrated Geographic Encoding and Referencing System - TIGER database. Digital database for the entire US containing political and administrative boundaries at a 1:100,000 scale.
04*	U.S Department of Agriculture. 1991. Updated Toiyabe National Forest Boundary in digital form.
04*	Milligan, G. 1992. The "Ranch" boundary digitized from annotation on "U.S. Department of Energy Nevada Test Site Roads and Facilities Map," undated July 1984.
04	U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", Boundaries. Beatty Mountain, Nevada, 1987, Provisional. East of Beatty Mountain, Nevada, 1987, Provisional. Topopah Spring NW, Nevada, 1961. Topopah Spring, Nevada, 1961. Carrara Canyon, Nevada, 1981, Provisional. Crater Flat, Nevada, 1986, Provisional. Busted Butte, Nevada, 1961, Photo-revised 1983. Jackass Flats, Nevada, 1961, Photo-revised 1983. Ashton, Nevada, 1987, Provisional. Big Dune, Nevada, 1986, Provisional. Amargosa Valley, Nevada, 1961, photo-revised 1983. Striped Hills, Nevada, 1961, photo-revised 1983.
05	Rautman, C., 1987. Sandia National Laboratories, IGIS product number CAL0194.
06	U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", U.S. Public Land Survey System. Beatty Mountain, Nevada, 1987, Provisional. East of Beatty Mountain, Nevada, 1987, Provisional. Topopah Spring NW, Nevada, 1961. Topopah Spring, Nevada, 1961. Carrara Canyon, Nevada, 1981, Provisional. Crater Flat, Nevada, 1986, Provisional. Busted Butte, Nevada, 1961, Photo-revised 1983. Jackass Flats, Nevada, 1961, Photo-revised 1983. Ashton, Nevada, 1987, Provisional. Big Dune, Nevada, 1986, Provisional. Amargosa Valley, Nevada, 1961, photo-revised 1983. Striped Hills, Nevada, 1961, photo-revised 1983.

(**) Reference Number correlates with Reference Number cited in Table 2.1 Types of Data Currently Being Stored in the GENISES.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

07 A 1:24,000 scale 7.5' topographic quadrangle index map has been prepared for an area covering the Nevada Test Site and Yucca Mountain Site Characterization Project. The index map also shows the availability of digital line graph data (DLG), which is updated quarterly with information provided by the USGS National Mapping Division. 1:24,000 scale DLG layers include: transportation, hydrography, boundaries, hypsography, and public land survey system. Digital Elevation Model (DEM) files are also available.

08 1:6,000 scale orthophotographs were generated in 1991 for an area covering the Repository Block Area. An index map has been prepared as a GIS coverage to show the areal extent and sheet boundaries for these orthophotographs. This index can also be used to identify the ten foot elevation contour maps and digital elevation models.

09 1:12,000 scale orthophotographs were generated in 1991 for an area covering the near-field study area. An index map has been prepared as a GIS coverage to show the areal extent and sheet boundaries for these orthophotographs. This index can also be used to identify the twenty foot elevation contour maps and digital elevation models.

10 Proposed Bureau of Land Management withdrawal boundary provided by Phil Ralphs (9-9-88). Boundaries delineated on a copy of a Public Land Survey System map with portions of sections identified.

11 U.S. Geological Survey. "Geographic Names Information System". This database contains digital files on more than 2 million place names and features in the US - from towns, schools, reservoirs, and parks to streams, valleys, springs and ridges. Each State file contains the names found on USGS topographic maps. For each geographic name listed, there are 15 descriptive elements, such as the descriptive name, type of feature, geographic coordinates and the name of the topographic map containing the feature.

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13* U.S. Department of Commerce. 1991. 1990 Census of Population and Housing, Summary Tape File 1A on CD-ROM. U.S. Bureau of the Census.

13 U.S. Department of Commerce, Bureau of the Census, 1990. "Topologically Integrated Geographic Encoding and Referencing System - TIGER database. Digital database for the entire US containing demographic features at a 1:100,000 scale.

14 U.S. Geological Survey, 1970. "National Atlas of the United States of America", Digital Line Graphs at 1:2,000,000 scale.

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TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

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TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

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Digital elevation contours at twenty foot intervals were generated in 1991 for an area covering the near-field study area. An index map has been prepared to show the areal extent and sheet boundaries for these contour maps.

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1986, Provisional. Busted Butte, Nevada, 1961, Photo-revised 1983. Jackass Flats, Nevada, 1961, Photo-revised 1983. Ashton, Nevada, 1987, Provisional. Big Dune, Nevada, 1986, Provisional. Striped Hills, Nevada, 1961, photo-revised 1983.

34 Digital elevation models were generated for the near-field study area (1:12,000 scale) from the 1991 orthophotograph process. The DEM has approximately a 250 foot grid.

35 Digital elevation models were generated for the Repository Block area (1;6,000 scale) from the 1991 orthophotograph process. The DEM has approximately a 160 foot grid.

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EG&G Energy Measurements, Inc., Environmental Studies Department, 1989. "Proposed Scent-Station Route C and Locations for Yucca Mountain Project", drafted onto USGS 1:24,000 scale 7.5' topographic quadrangle, Crater Flat, Nev.

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TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

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3.0 SIGNIFICANT ACTIVITIES THIS QUARTER

3.1 Data Added During 1/01/92 - 3/31/92:

PARTICIPANT	CITATION	TITLE
USDA	04	Update to Toiyabe National Forest boundary
DOE	04	Addition of boundary commonly referred to as the "Ranch".
EG&G/EM	13	Addition of 1990 Census data
USGS	17	Location change to Frenchman Flat and Crater Flat South trenches
USGS	17	Correction to location of Yucca Wash and Fortymile Wash trenches (SPYW-1)
USGS	17	Modification of Rock Valley trench locations
USGS	17	Modification of Crater Flat and Beatty Flat trench locations
USGS	17	Correction to pits P2, P3, and P4 locations
RSN	17	Correction to locations of trenches 14, A-1 and A-2
USGS	17	Corrections to locations of pavements 400 and 500
USGS	18	Modifications to locations of UZ-16 and UZ-15
LANL	18	Modification to location of proposed volcanic drillhole (USW V-2)
USGS	18	Addition of locations of proposed pits and pavements
USGS	18	Modification of exploratory studies facility, exploration drill holes, SRG-1, SRG-2, SRG-3, SRG-4, SRG-5, NRG-1, NRG-2, NRG-3, NRG-4, NRG-5, and NRG-6.
USGS	53	Modifications and additions to locations of groundwater monitoring station locations. Added AD17 and CF3; modified AD6, AM5 and AM7; changed JF3 from proposed to existing.
USGS	53	Addition of precipitation monitoring station locations (PMS1 - PMS3)

USGS	53	Update to precipitation monitoring station locations
USGS	53	Modifications of neutron bore holes N-17, N-36, N-15, N-16, N-11, N-27, N-37, N-38, N-53, N-54, N-55 and N-64.
USGS	65	Addition of water monitoring locations (U12n, U12n.03, U12n.05 and Rainier Mesa South).
USGS	65	Addition of soil moisture monitoring location SM1
USGS	73	Addition of gravity survey traverses
USGS	77	Addition of magnetotelluric survey locations for stations 11-14 and 16-26.

3.2 Requested and Delivered Products (1/01/92 - 3/31/92)

PRODUCT NUMBER	TITLE	REQUESTOR
YMP-91-025.1	YMP Existing Drillholes and Subsurface Access Drifts	Distel/M&O
YMP-91-026.1	YMP Proposed Drillholes and Subsurface Access Drifts	Distel/M&O
YMP-91-005.1	YMP Approved Roads map	White/YMPO
YMP-92-060.1	Small Mammal Study Areas	Cox/EG&G
YMP-92-061.1	Radiological Study Plots	Cox/EG&G
YMP-91-025.1	Existing Drillholes and Subsurface Access Drifts	Shephard/SNL
YMP-91-026.1	Proposed Drillholes and Subsurface Access Drifts	Shephard/SNL
YMP-91-008.1	YMP Orthophoto Sheet Index	Lewis/SAIC
YMP-92.064.1	Predator Study Areas	Gabbert/EG&G
YMP-90-045.4	Complete-Record and Crest Stage Stations	Johnson/USGS
YMP-90-059.2	Miscellaneous Stream Flow Stations	Johnson/USGS
YMP-91-039.2	YMP Environmental Sampling Locations	Lyon/EG&G
YMP-91-041.2	YMP Environmental Sampling Locations and Existing Activities	Lyon/EG&G

YMP-91-059.1	YMP Environmental Sampling Locations with 200 Meter Buffer and Existing Activities	Long/YMPO
YMP-91-053.1	YMP New Activities This Report	Handy/USGS
YMP-91-068.1	Top of Prow Pass Tuff (South)	Handy/USGS
YMP-91-069.1	Top of Calico Hills Tuff (South)	Handy/USGS
YMP-91-070.1	Top of Topopah Springs Tuff (South)	Handy/USGS
YMP-91-071.1	Top of Tiva Canyon Tuff (South)	Handy/USGS
YMP-91-072.1	Top of Caprock of the Tiva Canyon Tuff (South)	Handy/USGS
YMP-91-074.1	YMP, Desert Tortoise Sightings During FY91	Handy/USGS
YMP-91-075.1	YMP, Tortoise Study Areas	Handy/USGS
YMP-91-076.1	YMP, Existing Drillholes and Trenches within One Mile Radius Buffer of UZ-16	Handy/USGS
YMP-91-077.1	YMP, Tortoise Sightings Along Roads at Yucca Mountain	Handy/USGS
YMP-91-079.1	Yucca Mountain Raven Survey Routes	Handy/USGS
YMP-91-080.1	Control Raven Survey Routes	Handy/USGS
YMP-92-002.1	NRG - 1 Interference Evaluation	Rogers/M&O
YMP-91-025.1	Existing Drillholes and Subsurface Access Drifts	Spengler/USGS
YMP-91-026.1	Proposed Drillholes and Subsurface Access Drifts	Spengler/USGS
YMP-91-059.1	YMP Environmental Sampling Locations with 200 Meter Buffers and Existing Activities	Spengler/USGS
YMP-92-001.1	YMP Environmental Sampling Locations	Ostler/EG&G
YMP-91-039.2	YMP Environmental Sampling Locations	Distel/M&O
YMP-91-040.2	YMP Environmental Samping Locations	Distel/M&O
YMP-92-004.1	YMP Tortoise Study Areas	Rautenstrach/EG&G
YMP-92-003.1	YMP Regional Water-level and Spring Discharge Monitoring Sites	Fasano/SAIC

YMP-92-005.1	Post Activity Survey Plots	Gabbert/EG&G
YMP-92-001.1	YMP Environmental Sampling Locations	Green/EG&G
YMP-92-005.1	Roads Approved for Use Based on Completed Desert Tortoise Surveys with Selected Drillholes	Pysto/EG&G
YMP-91-025.1	Existing Drillholes and Subsurface Access Drifts	Heaney/SAIC
YMP-91-026.1	Proposed Drillholes and Subsurface Access Drifts	Heaney/SAIC
YMP-92-003.2	YMP Regional Water-level and Spring Discharge Monitoring Sites	Fasano/SAIC
YMP-91-026.1	Proposed Drillholes and Subsurface Access Drifts	Hattler/SAIC
YMP-92-008.1	YMP Environmental Sampling Locations	Green/EG&G
YMP-92.009.0	Basemap for Use with Mylar Overlays	White/YMPO
YMP-92-009.1	Subsurface Access Drifts Mylar Overlay	White/YMPO
YMP-92-009.2	Proposed Drillholes Mylar Overlay	White/YMPO
YMP-92-009.3	Existing Drillholes Mylar Overlay	White/YMPO
YMP-92-010.0	GIS Concept Graphic Viewfoil	Newbury/YMPO
YMP-90-045.4	Complete-record and Crest Stage Stations	Handy/USGS
YMP-90-059.2	Miscellaneous Stream Flow Stations	Handy/USGS
YMP-92-002.1	NRG-1 Interference Evaluation	Handy/USGS
YMP-92-004.1	YMP Tortoise Study Areas	Handy/USGS
YMP-92-060.1	Small Mammal Study Areas	Handy/USGS
YMP-92-061.1	Radiological Study Plots	Handy/USGS
YMP-92-064.1	Predator Study Areas	Handy/USGS
YMP-91-008.2	Orthophoto Sheet Index	Spengler/USGS
YMP-91-012.1	Faults and Alluvial Contacts	Spengler/USGS
YMP-91-060.1	Environmental Sampling Locations with 200 Meter Buffer and Proposed Activities	Spengler/USGS

YMP-91-059.1	Environmental Sampling Locations with 200 Meter Buffer and Existing Activities	Martin/LANL
YMP-91-060.1	Environmental Sampling Locations with 200 Meter Buffer and Proposed Activities	Martin/LANL
YMP-91-038.1	Proposed Excavations SNL Midway Valley Studies	French/REECo
YMP-92-011.1	YMP Digital Line Graph Data	Sowell/EG&G
YMP-92.014.0	OCRWM Tour Map	Newbury/YMPO
YMP-92-012.0	YMP Basemap	Martin/LANL
YMP-92-012.2	YMP Basemap	Martin/LANL
YMP-91-025.1	YMP Existing Drillholes and Subsurface Access Drifts	McNeish/M&O
YMP-92-015.0	Volcanic Vent Locations and Volcanic Flows	Crowe/LANL
YMP-91-025.1	YMP Existing Drillholes and Subsurface Access Drifts	Simms/SAIC
YMP-91-026.1	YMP Proposed Drillholes and Subsurface Access Drifts	Simms/SAIC
YMP-91-025.1	YMP Existing Drillholes and Subsurface Access Drifts	Williams/YMP QA
YMP-91-026.1	YMP Proposed Drillholes and Subsurface Access Drifts	Williams/YMP QA
YMP-92-023.0	YMP Ground Control Points	Mueller/EG&G
YMP-92-016.0	Northern Extent of Tortoises	Wills/EG&G
YMP-92-022.0	Revised Flood-prone Map Without Drillholes	Olsson/SAIC
YMP-92-022.1	Revised Flood-prone Map With Drillholes	Olsson/SAIC
YMP-92-022.2	Revised Flood-prone Map With Drillholes/ Yellow Contours	Olsson/SAIC
YMP-92-016.0	Northern Extent of Desert Tortoise	Wills/EG&G
YMP-92-024.0	Uranium Series Data	Johnson/M&O
YMP-92-021.0	YMP Field Planning Map, Busted Butte and Jackass Flats USGS 7-1/2' Quadrangles	Rautenstrauch/EG&G

YMP-91-025.1	YMP Existing Drillholes and Subsurface Access Drifts	Wonderly/REECo
YMP-91-026.1	YMP Proposed Drillholes and Subsurface Access Drifts	Wonderly/REECo
YMP-92-026.0	Local Area Map	Fransioli/SAIC
YMP-92-027.0	Air Quality and Meteorology Monitoring Sites	Fransioli/SAIC
YMP-92-028.0	Regional Area Map	Fransioli/SAIC
YMP-92-025.0	YMP, Area Designator Map	Sorenson/SAIC
YMP-91-025.1	YMP Existing Drillholes & Subsurface Access Drifts	St. Clair/M&O
YMP-92-026.1	YMP Proposed Drillholes & Subsurface Access Drifts	St. Clair/M&O
YMP-92-031.0	Calcite Silica Drillholes	St. Clair/M&O
YMP-92-032.0	Fortymile Wash Recharge Study	St. Clair/M&O
YMP-92-033.0	Solitario Canyon Fault Study	St. Clair/M&O
YMP-92-034.0	Natural Infiltration	St. Clair/M&O
YMP-92-035.0	Design Support Holes	St. Clair/M&O
YMP-92-036.0	Systematic Drilling Holes	St. Clair/M&O
YMP-92-037.0	Unsaturated Zone Drillholes	St. Clair/M&O
YMP-92-038.0	Volcanic Drilling	St. Clair/M&O
YMP-92-039.0	Water Table Holes	St. Clair/M&O
YMP-92-040.0	Drillholes for Water Supply & Tests	St. Clair/M&O
YMP-92-041.0	Geologic Holes	St. Clair/M&O
YMP-92-042.0	Southern Tracer Complex	St. Clair/M&O
YMP-92-043.0	In Situ Stress Drilling	St. Clair/M&O
YMP-92-044.0	Artificial Infiltration	St. Clair/M&O
YMP-91-026.1	YMP Proposed Drillholes and Subsurface Access Drifts	Clanton/YMPO
YMP-92-003.1	YMP Regional Water Level and Spring-Discharge Monitoring Sites	Handy/USGS

YMP-92-003.2	YMP Regional Water Level and Spring-Discharge Monitoring Sites	Handy/USGS
YMP-92-004.1	YMP Tortoise Study Areas	Handy/USGS
YMP-92.005.1	Post Activity Survey Plots	Handy/USGS
YMP-92-008.0	YMP Environmental Sampling Locations	Handy/USGS
YMP-92-008.1	YMP Environmental Sampling Locations	Handy/USGS
YMP-92-009.0	Basemap for Use with Mylar Overlays	Handy/USGS
YMP-92-009.1	Subsurface Access Drifts	Handy/USGS
YMP-92-009.1	Proposed Drillholes Mylar Overlay	Handy/USGS
YMP-92-009.3	Existing Drillholes Mylar Overlay	Handy/USGS
YMP-92-010.0	GIS Concept Graphic	Handy/USGS
YMP-92-011.0	YMP Digital Line Graph Data	Handy/USGS
YMP-92-012.0	YMP Basemap	Handy/USGS
YMP-92-012.1	Faults and Alluvial Contacts	Handy/USGS
YMP-92-014.0	OCRWM Tour Map	Handy/USGS

4.0 UPCOMING MAJOR ACTIVITIES

4.1 EG&G/EM RSL YMP SUPPORT OFFICE

Two Geographic Information System workstations and 3-D modeling workstation are fully functional at the Support Office. The large format black-and-white thermal plotter has been installed and integrated into the system; E-size black-and-white plots can now be generated at the Support Office.

A personal computer (PC) version of ARC/INFO has been installed and is being used at the digitizing station. A UNIX version of ArcView has been received and will be installed during the next quarter. A PC version of ArcView has been ordered.

During the next quarter a telecommunications plan will be developed to address remote access issues.

4.2 The Geographic Nodal Information Study and Evaluation System (GENISES) Database.

The development of the GENISES database is progressing as planned. The system file structure has been established and existing data are now being cataloged, annotated with the data lineage, and added to the data dictionary. Administration files to track products as well as data maintenance activities have been established.

During the next quarter, the transition of the SEPDB will begin. This will dictate the majority of the GENISES staff requirement. ArcView data sets will be developed for distribution to the beta site (TDB).

4.3 Site Atlas Map Portfolio

A draft of the YMP Site Atlas revision was completed. After incorporation of Participant review comments, the Site Atlas will be submitted for printing.

APPENDIX GENISES-A

YMP GENISES WORK REQUEST FORM

BLANK WORK REQUEST FORM

EG&G ENERGY MEASUREMENTS

YMP GENISES WORK REQUEST

SEND TO:
GENISES Technical Database Administrator
RSL YMP Support Office
EG&G Energy Measurements, Inc.
P.O. Box 1912, M/S V-02
Las Vegas, Nevada 89125
Telephone: FTS 544-7448 FAX: FTS 544-7469

To be completed by GENISES Database Personnel:
Request No: _____
Job No: _____
Date requested: _____

TO BE COMPLETED BY THE REQUESTOR:

DATE: _____

NAME _____ SIGNATURE _____

ORGANIZATION _____ TELEPHONE _____

ADDRESS _____

PURPOSE OF REQUESTED DATA: _____

IS THE PRODUCT QUALITY-AFFECTING? _____ DATE DUE _____

COMMENTS (If the request is for copies of existing maps or reports, the requestor should provide the EG&G/EM map reference number located in the lower right corner of all map products. If this is a request for a new product or modification to an existing product, please describe desired product or modification and include any QA requirements drawings, maps, or listings, as appropriate.)

PRODUCT FORMAT:

HARDCOPY: _____ NUMBER OF COPIES: _____ MAP SIZE OR SCALE _____

DIGITAL _____ OS _____ FILE FORMAT _____ MEDIA: _____

To be completed by GENISES Database Personnel

RECEIVED BY: _____ DATE: _____
ASSIGNED TO: _____ DATE: _____
VERIFIED BY: _____ DATE: _____
APPROVED BY: _____ DATE: _____

PRODUCT OR ACCESSION NUMBERS _____

YMSO-001 WHITE: Original YELLOW: MRSD Copy PINK: Analyst Copy GOLDENROD: Originator Record Copy

THE GEMBOCHS DATABASE AND SOFTWARE LIBRARY

YMP-TDB QUARTERLY REPORT

JAMES W. JOHNSON AND SUZANNE R. LUNDEEN

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LAWRENCE LIVERMORE NATIONAL LABORATORY
LIVERMORE, CA 94550

Table of Contents

Overview of the GEMBOCHS Database and Software Library

The GEMBOCHS (Geologic and Engineering Materials: Bibliography Of Chemical Species) database contains compositional and thermodynamic data for over 2000 chemical species, including virtually all endemic and potential contaminant species relevant to Yucca Mountain. These data, retrieved from an extensive literature search during the past decade (Appendix A), represent a fundamental component of our ability to quantitatively predict the chemical consequences of irreversible fluid-rock reactions that may occur within the post-emplacement repository environment at Yucca Mountain. Other fundamental components of this predictive capability include the various theoretical models used to represent (1) the thermodynamic behavior of chemical species as a function of temperature (T) and pressure (P), (2) the equilibrium distribution of elemental mass among coexisting species as a function of T, P, and bulk composition, and (3) the redistribution of this mass among these species as a function of imposed chemical and/or thermal disequilibrium. Each of these successive models is inherently dependent upon each of its predecessors: e.g., the calculations involved in model (3) require as input the results of models (1)-(2), which in turn are dependent on GEMBOCHS data. The Database Development Task at LLNL maintains and develops GEMBOCHS as well as an extensive software library, which includes a suite of routines that implement model (1) above. The EQ3/6 Code Development Task, also at LLNL, maintains and develops the EQ3/6 software package, which facilitates practical application of models (2) and (3) to address geochemical problems.

GEMBOCHS is a relational database that resides in the Database Development Task's local installation of the Ingres relational database management system. Formal requests for changes or additions to GEMBOCHS can be submitted by contacting the GEMBOCHS database administrator via the standard electronic mail system (see below); such requests require concomitant submittal of a TDIF and Data Transmittal Package in accordance with YMPO AP-5.2Q. These change requests are processed locally using CNGBOCHS, an interactive code that can be viewed as an automated tracking and filing system for the requests as they are reviewed and resolved. Modifications and additions to GEMBOCHS are incorporated locally using DBAPP, an interactive program that interfaces the user with GEMBOCHS tables, permits selected users having password-restricted access to update the tabulated data, and automatically reports these updates to a dedicated audit table.

The software interface between GEMBOCHS and the EQ3/6 modeling package consists of two programs: DOOUT and EQPT. DOOUT accesses data for the user-specified subset of GEMBOCHS species, calculates aqueous dissociation constants for these species as a function of T and P using the theoretical models noted in (1) above, and generates the DATAO file - a formatted ASCII file that contains all data explicitly required by the EQ3/6 package as well as many other data of interest to EQ3/6 users. EQPT reads the DATAO file, fits the aqueous dissociation-constant grids to interpolating polynomials, and writes the calculated polynomial coefficients together with all other required data to the DATA1 file - an unformatted file that is read directly by EQ3 and EQ6.

It is important to emphasize the fact that GEMBOCHS itself cannot be interfaced directly with EQ3/6 or any other alternate geochemical modeling package; a software pipe, DOOUT-EQPT or one of their derivative analogs, is always required. Of course, this requirement is actually advantageous: it ensures the continued versatility and integrity of GEMBOCHS data because (1) GEMBOCHS is not structurally tied to any one geochemical modeling code, (2) DOOUT-EQPT clones that interface GEMBOCHS with new modeling software are readily developed, and (3) GEMBOCHS itself is not modified when generating such clones.

The following report provides a summary of GEMBOCHS database contents, describes the major programs contained in the GEMBOCHS software library, discusses the use of GEMBOCHS by YMP participants, outlines the procedure by which these participants may request modifications to GEMBOCHS, and tabulates all such modifications incorporated during the current calendar year quarter. First, however, a few words summarizing the association between GEMBOCHS (i.e., the LLNL Database Development Task) and YMP participants that use this database.

The GEMBOCHS-YMP Association

The LLNL Database Development Task has been funded, at various levels of support, by the YMP and its predecessors (NNWSI, etc.) from FY82 to the present. This continuous funding has reflected the critical, ongoing dependence of other project participants on maintaining and developing GEMBOCHS (which in the past has been referred to as the LLNL Thermochemical Database, MDAIN, etc.). This dependence on GEMBOCHS is primarily through its use with the EQ3/6 modeling package, which has also been funded by these projects. Current YMP-sponsored research activities that depend heavily on the continued availability of GEMBOCHS and EQ3/6 include modeling of ion-exchange processes associated with fluid-zeolite interactions (B. Viani, C. Bruton, LLNL), experimental studies of glass wasteform dissolution (W. Bourcier, LLNL), and numerical simulation of groundwater chemistry at Yucca Mountain within the pre- and potential post-emplacement environment (W. Steinkampf, USGS; M. Ebinger, LANL). Other DOE-sponsored activities that use GEMBOCHS and EQ3/6 extensively include ongoing environmental remediation projects at Fernald, OH (contact: J. Carr, DOE) and Rocky Flats, CO (contact: D. Simonson, DOE) and studies of brine chemistry associated with the WIPP project (contact: L. Brush, DOE).

The GEMBOCHS Database: Summary of Contents

The particular collection of thermodynamic data and associated regression coefficients (equation-of-state parameters, heat capacity coefficients, etc.) required by a specific geochemical modeling code varies somewhat as a function of the processes being modeled and the theory and equations being used to represent these processes. Nevertheless, there is considerable overlap in the thermodynamic data required to calculate the standard molal thermodynamic properties of species as a function of T and P,

the equilibrium distribution of elemental mass among coexisting phases as a function of T, P, and bulk composition, and the evolution of this distribution as a consequence of chemical and/or thermal perturbation. The GEMBOCHS database contains all of the thermodynamic data and regression parameters required to perform each of these modeling activities using most of the geochemical software packages currently available.

The compositional and thermodynamic data contained in each of the 23 GEMBOCHS tables are listed and briefly defined in the GEMBOCHS Data Dictionary, which is given in Appendix B. For the convenience of those interested in what data are used for each type of chemical species, the following skeletal outline is also provided.

Compositional Data for Minerals, Gases, or Aqueous Species

Elemental Composition
Common Name

Reaction Data for Aqueous Dissociation of Minerals, Gases, or Aqueous Species

Reaction Stoichiometry
Equilibrium Constants
Pressure, Temperature Conditions
Standard Molal Gibbs Free Energies of Reaction
Standard Molal Enthalpies of Reaction
Standard Molal Entropies of Reaction
Standard Molal Volumes of Reaction
Standard Molal Heat Capacities of Reaction
Parameter Units
Literature References

Thermodynamic Data for Minerals

Standard Molal Gibbs Free Energy of Formation
Standard Molal Enthalpy of Formation
Standard Molal Entropy at Reference Pressure (Pr) and Temperature (Tr)
Standard Molal Volume at Pr, Tr
Standard Molal Heat Capacity at Pr, Tr
Molecular Weight
Heat Capacity Coefficients
Temperature Limits on Heat Capacity Coefficients
Standard Molal Enthalpy of Transition
Standard Molal Entropy of Transition
Standard Molal Volume of Transition
Clapeyron Slope
Parameter Units
Literature References

Thermodynamic Data for Gases

Standard Molal Gibbs Free Energy of Formation
Standard Molal Enthalpy of Formation
Standard Molal Entropy at Pr, Tr
Standard Molal Volume at Pr, Tr
Standard Molal Heat Capacity at Pr, Tr
Molecular Weight
Heat Capacity Coefficients
Temperature Limits on Heat Capacity Coefficients
Parameter Units
Literature References

Thermodynamic Data for Aqueous Species

Standard Molal Gibbs Free Energy of Formation
Standard Molal Enthalpy of Formation
Standard Molal Entropy at Pr, Tr
Standard Molal Volume at Pr, Tr
Standard Molal Heat Capacity at Pr, Tr
Molecular Weight
Equation-of-State Coefficients
Debye-Huckel Parameters
Ionic Charge
Electronic Entropy
Parameter Units
Literature References

The GEMBOCHS Software Library: Selections of Relevance to YMP

The database software library facilitates maintenance and development of the GEMBOCHS database and its practical use to address relevant environmental problems via geochemical modeling packages such as EQ3/6. Only those four programs that are directly relevant to the YMP's current use of GEMBOCHS are summarized below.

CNGBOCHS

CNGBOCHS is an interactive program that permits on- or off-site GEMBOCHS users having access to the gov electronic mailing domain to submit formal change requests using the standard electronic mail (Email) utility; note that such requests must be accompanied by concomitant submittal of a TDIF and Data Transmittal Package in accordance with AP-5.2Q. CNGBOCHS, which interfaces Email, a dedicated Ingres database (CNGREQ), and the Interleaf desktop publishing package, also provides the local Database Development staff with a convenient tracking and filing system for the process of reviewing, resolving, and verifying resolution of these change requests.

A given Email change request is first filed in CNGREQ; subsequently, its status evolves from "review" to "assigned" to "verification" and finally to "completion". At each stage of this evolution, the responsible party submits their comments or a report of their actions to CNGREQ via an electronic form that interfaces the party with this database. The status of the request then changes, and an Email message indicating this change is sent to all those affected. At any point during this process, the electronic form which summarizes the current disposition of the change request can be printed using the built-in interface to Interleaf.

DBAPP

DBAPP is an interactive FORTRAN77-Equel code that facilitates review of GEMBOCHS data by all local users and modification of these data by selected members of the Database Development staff. DBAPP interfaces the user with GEMBOCHS via an extensive suite of electronic forms. These forms permit any user to browse through GEMBOCHS data, and a smaller set of password-restricted users to modify, augment, or delete these data. The operative status of new species is either "active" or "notused". "Active" species appear in release versions of the DATA0 suite for use with EQ3/6 whereas "notused" species are restricted to use within the trial DATA0 files used locally. In addition, DBAPP automatically reports all GEMBOCHS updates to a dedicated audit table, which contains the complete modification history of GEMBOCHS.

D0OUT

D0OUT is a FORTRAN77-Equel code that serves as a software pipe between GEMBOCHS and EQPT. D0OUT performs the following functions: (1) retrieves data from GEMBOCHS for the user-specified subset of chemical species (currently, there are five such subsets; these are described below), (2) calculates aqueous dissociation constants for these species from 0 to 100 C at 1.0132 bars and from 100 to 300 C along the $H2^0$ vaporization boundary using the SUPCRT91 equation of state, CrissCobble extrapolation, or DQUANT method for aqueous species and Cp integration for solids, gases, and liquids, and (3) generates the DATA0 file, a formatted ASCII file that contains the dissociation constants, all other data explicitly required for EQ3/6 calculations, and various other species data of interest to EQ3/6 users.

EQPT

EQPT is a FORTRAN77 code that serves as a software interface between the DATA0 file produced by D0OUT and the EQ3/6 geochemical modeling package. EQPT performs the following functions: (1) reads the DATA0 file, (2) fits species dissociation constants to interpolating polynomials, and (3) generates the DATA1 file, an unformatted equivalent of DATA0 where species dissociation constants are replaced with their associated polynomial

regression coefficients, and all data not explicitly required for EQ3/6 calculations has been filtered.

Note that although D0OUT and EQPT could be readily consolidated into a single code, there are significant advantages associated with maintaining their independence. Specifically, the present arrangement (1) provides users with a wealth of additional, relevant data not explicitly required by EQ3/6, (2) provides this data in a formatted ASCII file which can be viewed, printed, and edited, (3) provides users with the option of customizing DATA0 files by adding new species or modifying data for existing species, and (4) minimizes EQ3/6 run-time costs associated with reading these large thermodynamic databases by providing these data on an unformatted file that contains only those data explicitly required for the calculations.

Use of GEMBOCHS by YMP Participants

In general, YMP participants use the GEMBOCHS database strictly through its association with the EQ3/6 software package. Hence, the typical YMP user's only contact with GEMBOCHS is in the form of the various DATA0 files produced by D0OUT (see above). Five distinct DATA0 files are presently available for use with the current release version (3245.1090) of EQ3/6. This suite of files is listed below:

DATA0 filename	Description	# of species
DATA0.com.R1O	Composite database	1834
DATA0.sup.RIO	SUPCRT91 database	462
DATA0.nea.RIO	NEA/CODATA database	424
DATA0.pit.RIO	Pitzer database	488
DATA0.hmw.RIO	Harvey-Moller-Weare database	71

Each of these five files is designed to meet specific geochemical modeling needs; for a given EQ3/6 modeling problem, the appropriate DATA0 file is determined on the basis of compositional complexity, required level of internal consistency, and desired formalism for calculating activity coefficients.

The "R1O" suffix of a given DATA0 filename refers to the release number of the file. A new suite of DATA0 files having incremented suffixes is generated and released as often as required by modifications and additions to GEMBOCHS.

Access to EQ3/6 and the complete suite of DATA0 files may be obtained by contacting Tom Wolery of LLNL (FTS-532-5789).

Procedure for Requesting Modifications or Additions to GEMBOCHS

Anyone having access to the government (gov) domain of the standard

electronic mail network (Email) can request modifications or additions to GEMBOCHS by sending an Email message describing the request to cngbochs@s33.es.llnl.gov; the requestor must also submit concomitantly a TDIF and Data Transmittal Package in accordance with AP-5.2Q. To facilitate timely resolution, the subject field of these Email change requests must be assigned the string "GEMBOCHS request", and the following text must contain all information required to resolve the request. Typically, this information will include (1) the requestor's full name and phone number, (2) a complete description of the request (i.e., the error report or request to add data), (3) a summary of all references supporting the request, and if (2) defines an error report, also (4) the specific DATA0 file(s) (including version number) where the error occurs.

Change requestors are notified by CNGBOCHS (via Email) as their requests move from "review" to "assigned" to "verification" to "completion" status.

Those who do not have Email access may request changes by contacting Jim Johnson of LLNL (FTS-543-7352).

Modifications and Additions to GEMBOCHS: 1st Qtr., 1992

The subset of the GEMBOCHS audit table that covers the first quarter of 1992 (1 January - 31 March) is given in Appendix C. This table summarized all GEMBOCHS modifications that were incorporated during this time. The following sections describe these updates as they appeared in three new suites of thermodynamic databases (DATA0 files) that were generated for use with the current EQ3/6 software package (version 7.0) during the first quarter of 1992.

DATA0 Suites R10 to R11:

In late January, DBAPP, D0OUT, and EQPT were used to generate the R11 suites of DATA0 (and DATA1) files for use with EQ3/6, version 7.0. Appendix D1 provides a summary of all modifications and additions to GEMBOCHS that were incorporated between the release of DATA0 suite R10 and R11. The only modification which appears explicitly in the R11 suite is the presence of revised and improved thermodynamic data for five hydrated clinoptilolite species (data provided by Dr. Brian Viani, LLNL-YMP). However, two additional significant updates were incorporated between the release of suites R10 and R11 that do not appear in the R11 suite: (1) intra-GEMBOCHS conversion of all references to chemical elements (e.g., species names, formulas, and compositions) from the unfortunate historical convention of uniform lower case to the correct convention of mixed upper and lower case per definition of the individual elements, and (2) the addition of fifteen fictive alkali oxides and halogens.

The rather time-consuming task of completing this internal conversion of species names, formulas, and compositions to the correct elemental capitalization scheme is significant because it eradicates the ambiguities associated with the previous convention of uniform lower case (for example, "co" could be interpreted as either carbon monoxide or cobalt). Unfortunately, DATA0 files that incorporate this new, correct naming convention cannot presently be used with version 7.0 of the EQ3/6 package. Fortunately, this incompatibility (which necessitates conversion of the new

DATA0 files, in their entirety, to lower case prior to use with EQ3/6) will vanish following minor modification of the EQ3/6 package.

Addition of the fifteen fictive species noted above was required as part of a much larger scale project that was completed between the release of DATA0 suites R10 and R11: development and implementation of a new output option for DOOUT that facilitates generation of thermodynamic datafiles from GEMBOCHS that are of appropriate format for use with GT, a geochemical modeling package developed by Dr. Craig Bethke, Univ. Illinois. GT calculations are closely analogous to those performed by EQ3/6; hence, implementation of this new DOOUT output option facilitates valuable comparison of the two packages using identical thermodynamic data.

One very useful feature of GT (which is unavailable in EQ3/6) is the ability to specify the composition of reactant materials as the bulk concentrations of oxide components, which are commonly available from experimental analyses. These components need not represent actual phases of the reactant material, nor must their associated thermodynamic data be available. In fact, such data are not presently available for the fifteen species added; hence, their "fictive" character. This modeling capability is particularly useful in the study of irreversible reactions that involve borosilicate glasses (e.g., the experimental and modeling work being carried out by Dr. William Bourcier, LLNL-YMP), where oxide analyses are typically the only compositional data available.

DATA0 Suites R11 to R12:

Owing to a minor inconsistency that was inadvertently introduced into GEMBOCHS during the above-described introduction of appropriate capitalization for the chemical elements, dissociation constants reported to R11 files for certain solids were slightly in error. At the same time this inconsistency was discovered (mid-February), an unfortunate hard-disk crash occurred on the sun server where GEMBOCHS and its associated software are located. Subsequently, unexpected difficulties were encountered during attempted file restoration from recent backup tapes. Ultimately, GEMBOCHS itself had to be restored from backup tapes written in late December, 1991. Hence, the element capitalization effort described above had to be replicated. First, however, the erroneous calculations reported in the R11 suite had to be eliminated.

During late February, DBAPP, DOOUT, and EQPT were used to generate the R12 suites of DATA0 (and DATA1) files for use with EQ3/6, version 7.0). Appendix D2 provides a summary of all modifications and additions to GEMBOCHS that were incorporated between the release of DATA0 suites R11 and R12. The slight errors in certain dissociation constants that surfaced in R11 were successfully eliminated in R12. Additional modifications that appear explicitly within the R12 suite include (1) the removal of five aqueous acetate and phthalate species, which were eliminated pending verification of the calculations performed to extrapolate the relevant data from those reported in the literature to those consistent with the adopted infinite-dilution standard state, and (2) the removal of an additional aqueous species, which was in fact the thermodynamic duplicate (doppelganger) of another GEMBOCHS species.

DATA0 Suites R12 to R13:

During late March, DBAPP, DOOUT, and EQPT were used to generate the R13 suites of DATA0 (and DATA1) files for use with EQ3/6, version 7.0. Appendix D3 provides a summary of all modifications and additions to GEMBOCHS that were incorporated between the release of DATA0 suites R12 and R13. In R13, the correct elemental capitalization scheme for species names, formulas, and compositions - which was introduced in R11 but did not appear in R12 owing to the hard-disk crash noted above - has been restored. In addition, two minor errors were also repaired, as indicated in Appendix D3.

Beyond R13:

Also during late March, we initiated a major restructuring of the sets of basis and auxiliary basis aqueous species that exist in GEMBOCHS and are used in EQ3/6 calculations. This restructuring will result in significantly improved flexibility with regard to the range of geochemical problems that can be addressed using the EQ3/6 modeling package, particularly those problems that involve aqueous organic species. Virtually all of the entries in Appendix C that do not also appear in Appendices D1-D3 are related to this project. New suites of DATA0 files will be generated upon completion of this restructuring.

Concluding Remarks

The GEMBOCHS thermodynamic database and its associated software library together represent a comprehensive and versatile package that can be used to quantitatively address a myriad of geochemical modeling problems. Included among these are several ongoing YMP-sponsored studies that specifically address potential environmental concerns associated with the potential repository at Yucca Mountain.

Appendix A

GEMBOCHS REFERENCES

APPENDIX A: GEMBOCHS References

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Appendix B

GEMBOCHS DATA DICTIONARY

APPENDIX B: GEMBOCHS Data Dictionary

The data dictionary defines each column variable and its valid range of values for each data table in the GEMBOCHS thermodynamic database. Column variables that must be assigned a non-null value are underlined.

Table: AQUEOUS

Aqueous species data.

1 row per species.

Aqueous.NAME
- Description: primary key
- Range: Species.NAME where Species.TYPE= aqueous

Aqueous.TYPE
- Description: type of aqueous species
- Range: Enumerated:
  - basis — strict basis species
  - aux — alternate basis species
  - aqueous — non-basis species

Aqueous.CHG
- Description: ionic charge
- Range: integer

Aqueous.ITYPE
- Description: Criss-Cobble ion type values, only entered for those species listed by Criss and Cobble (1964a,b)
- Range: Enumerated:
  - 1 simple cations
  - 2 simple anions and oh-
  - 3 oxy-anions
  - 4 acid oxy-anions

Aqueous.ACT_FLAG
- Description: flag for O_2(aq), H_2(aq), SiO_2(aq) for EQ3/6 activity coefficient formalism
- Range: negative integer

Aqueous.SE
- Description: internal electronic entropy (cal) used in Criss-Cobble extrapolations for rare earth and lanthanide species
- Range: positive real number

Aqueous.AZERO
Description ion size parameter used for EQ3/6 BDOT activity coefficient formalism data values are entered as listed for species in Nordstron and Munoz (1986,p. 200) after Kielland (1937)
Otherwise:
if Aqueous.CHG <1 then = 4.0
+1 then = 4.0
+2 then = 4.5
+3 then = 5.0
+4 then = 5.5
>4 then = 6.0

Aqueous.BDOT
Description bdot parameter
Range real number

Aqueous.CP
Description partial molal heat capacity (cal/mol)
Range real number

Aqueous.SOURCE
Description data citation
Range 10 character field

Table: AUDIT

Documentation for all GEMBOCHS data changes.

0-n rows per species

Audit.SPECIES
Description name of changed species
Range Species.NAME

Audit.TAB
Description GEMBOCHS table
Range 24 character field

Audit.COL
Description GEMBOCHS column
Range 24 character field

Audit.OLD_VAL
Description previous data value
Range 24 character field

Audit.NEW_VAL
Description new data value
Range 4 character field

Audit.UPDATE_BY
Description DBAPP user name
Range 24 character field

Audit.DATE CNG
Description date update made
Range 24 character field
Audit.REQUEST BY
Description name of person requesting data change
Range 24 character field
Audit.COMMENTS
Description additional comments
Range 64 character field

Table: AUTHORITY

Contains a list of users authorized to change GEMBOCHS data, and their passwords

1 row per user

Authority.PERSON
Description user name
Range 24 character field
Authority.PASSWORD
Description user's password
Range 24 character hidden field

Table: COMMENTS

User comments about selected species

0-n rows per species

Comments.NAME
Description species name
Range 24 character field

Comments.DESCRIPTION
Description user comments
Range 160 character field

Table: COMPOSITION

The stoichiometery for each species.

1 - n rows per species.

Composition.NAME
Description primary key
Range Species.NAME

Composition.COEFF
  Description toichiometric coefficient
  Range positive real number

Composition.SPECIES
Description refstate element
Range if Species.TYPE = ss then
  Mineral.NAME where Mineral.TYPE = solid
 else
  Mineral.NAME where Mineral.STATE = refstate

Table: CP

Coefficients for the heat capacity polynomial

0-n rows per solid/liquid/gas

Cp.NAME
  Description primary key
  Range Species.NAME where
  Species.TYPE= mineral
Cp.SOURCE
  Description primary cited reference
  Range References.SQUIBB

Cp.UNITS
  Description cited units
  Range Enumerated:
    cal
    jou
Cp.LIMIT
  Description temperature limit for polynomial (°K)
  Range positive real number
Cp.T0
  Description constant, T**0 term
  Range real number
Cp.T1
  Description coefficient, T**1 term
  Range real number
Cp.T_1
  Description coefficient, T**-1 term
  Range real number

Cp.T2
  Description coefficient, T**2 term
  Range real number
Cp.T_2
  Description coefficient, T**-2 term
  Range real number
Cp.T3
  Description coefficient, T**3 term
  Range real number
Cp.T_3
  Description coefficient, T**-3 term
  Range real number
Cp.THALF
  Description coefficient, T**0.5 term
  Range real number
Cp.T_HALF
  Description coefficient, T**-0.5 term
  Range real number
Cp.ERROR
  Description estimated polynomial error
  Range 10 character field

Table: CPTRAN

Contains heat capacity transition data

Cp.NAME
  Description primary key
  Range Species.NAME where Species.TYPE= mineral
Cptran.SOURCE
  Description primary cited reference
  Range References.SQUIBB
Cptran.DELHTR
  Description standard molal enthalpy of transition
  Range real number
Cptran.DELSTR
  Description standard molal entropy of transition
  Range real number
Cptran.SLOPE
  Description Clapeyron slope
  Range real number
Cptran.VTR
  Description standard molal volume of transition
  Range real number

Table: EOS

Contains SUPCRT EOS data

EOS.NAME
  Description species name
  Range 24 character field
EOS.A1
  Description EOS coefficient, a1
  Range real number
EOS.A2
  Description EOS coefficient, a2
  Range real number
EOS.A3
  Description EOS coefficient, a3
  Range real number
EOS.A4
  Description EOS coefficient, a4
  Range real number
EOS.C1
  Description EOS coefficient, c1
  Range real number
EOS.C2
  Description EOS coefficient, c2
  Range real number
EOS.W
  Description EOS coefficient, w
  Range real number

Table: GHS

GHS thermodynamic data values.

GHS.NAME
  Description primary key
  Range Species.NAME
GHS.SOURCE
  Description reference citation for DELG0,DELH0,SZER0
GHS.UNITS
  Description defined as follows:
    cal= kcav/mol for DELG0,DELH0
      = cal/mol for SZER0
    jou= kj/mol for DELG0,DELH0
      = j/mol for SZER0
  Range Enumerated:
    cal
    jou

GHS.DELG0
  Description apparent standard molal Gibbs free energy of formation
  Range real number
GHS.DELH0
  Description apparent standard molal enthalpy of formation
  Range real number
GHS.S0
  Description conventional or absolute entropy
  Range real number
GHS.V0
  Description partial molal/molar volume (cm/mol)

Table: LABELS

User defined species subsets.

0-n rows per species.

Labels.NAME
  Description primary key
  Range Species.NAME

Labels.TYPE
  Description code to distinguish type of subset
  Range Enumerated:
  est subset identifying estimated data
  sub user defined subset

Labels.CLASS
  Description estimated variable or subset name
  Range If Labels.TYPE= est
  then GEMBOCHS column
  else 16 character field

Table: LOGK

Logk data as a function of temperature.

0-n rows per species

LOGK.NAME
  Description primary key
  Range Species.NAME
LOGKSOURCE
  Description reference citation for LOGK
  Range References.SQUIBB

LOGK.TEMP
- Description: measured temperature for LOGK (°C)
  Note: if Basic.GFLAG = 3 and Basic.KSOURCE= tpgrid
  a Tpgrid.TEMP at 25°C must be entered
- Range: positive real number

LOGK.PRES
- Description: pressure corresponding with temperature in Tpgrid.TEMP
- Range: positive real number

LOGK.LOGK
- Description: LOGK value
- Range: real number

Table: Mineral

Additional data for solid, liquid, gas and solid solutions

1 row per mineral species

Mineral.NAME
- Description: primary key
- Range: Species.NAME where Species.TYPE=mineral

Mineral.TYPE
- Description: EQ3/6 species type.
- Range: Enumerated:
  - liquid: liquid species
  - solid: solid/mineral species
  - gas: gaseous species
  - ss: solid solution

Mineral.COMPOSITION
- Description: chemical composition of mineral name.
- Range: 55 character field

Mineral.ALTNAME
- Description: alternate species name
- Range: 24 character field

Mineral.VARIETY
- Description: crystalline form of polymorphs
- Range: Enumerated:
  alpha, beta, gamma, etc.

Mineral.STATE
- Description: crystalline state of species, identifies hypothetical endmembers of solid solutions, reference state elements, forms of solid solutions, or polymorphs.

Range	Enumerated: ideal regular refstate hypothetical polymorph

---

Table: PARAMETERS

Miscellaneous parameter grids needed for data0 header listing. Parameters include: temperature, pressure, Criss-Cobble parameters, Debye-Huckel constants, solution solution mixing parameters.

Parameters.NAME	
Description	type of parameter
Range	30 character field
Parameters.ONE	
Description	parameter value
Range	real number
Parameters.TWO	
Description	parameter value
Range	real number
Parameters.THREE	
Description	parameter value
Range	real number
Parameters.FOUR	
Description	parameter value
Range	real number
Parameters.FIVE	
Description	parameter value
Range	real number
Parameters.SIX	
Description	parameter value
Range	real number
Parameters.SEVEN	
Description	parameter value
Range	real number
Parameters.EIGHT	
Description	parameter value
Range	real number
Parameters.NINE	
Description	parameter value
Range	real number
Parameters.TEN	
Description	parameter value
Range	real number

Parameters.ELEVEN	
Description	parameter value
Range	real number
Parameters.TWELVE	
Description	parameter value
Range	real number
Parameters.PITNUM	
Description	order to print in Pitzer output file
Range	integer
Parameters.BDOTNUM	
Description	order to print in Bdot output file
Range	integer
Parameters.HMWNUM	
Description	order to print in HMW output file
Range	integer

Table: REACTION

Species and coefficients for Data0 RXN and REF RXN.

0-n rows per species.

Reaction.NAME	
Description	primary key
Range	Species.NAME
Reaction.SOURCE	
Description	citation of reference reaction (required when Reaction.TYPE=ref)
Range	10 character field
Reaction.TYPE	
Description	code to distinguish kind of reaction
Range	Enumerated: d0 Data0 RXN ref REF RXN
Reaction.COEFF	
Description	coefficient associated with Reaction.SPECIES
Range	real number
Reaction.SPECIES	
Description	component species in the reaction

Range	if Reaction.TYPE= d0 then
	Aqueous.NAME
	where Aqueous.TYPE= basis or Aqueous.TYPE= aux
	else
	Species.NAME

Table: REFERENCES

Complete reference citations for all data sources.

References.SQUIBB
  Description: reference citation in SQUIBB format: year,author and secondary author: yypri/sec
  Range: 10 character field

References.AUTHOR
  Description: author(s), by last name, first initials
  Range: 160 character field

References.YR
  Description: year published
  Range: positive integer > 1850

References.YR_ALT
  Description: designator for multi-year citations
  Range: 1 character field, ascending order

References.TITLE
  Description: complete reference title
  Range: 300 character field

References.PUBLISHER
  Description: publisher or journal
  Range: 80 character field

References.VOL
  Description: volume number
  Range: 5 character field

References.PAGES
  Description: page numbers
  Range: 1-2 character field

References.XCOPY
  Description: reference copy information
  Range: Enumerated:

yes	copy in GEMBOCHS reference library
no	copy not in reference library
abs	abstract in reference library
ord	copy requested

References.FILE
  Description: defined as follows:
  Range: Enumerated:

aux	reference not used in data0
pending	possible future reference
primary	current data0 reference

Table: REFSTATE

Properties of reference-state elements.

1 row per element

Refstate.NAME	
Description	element name in most common form
Range	Mineral.NAME where Mineral.STATE=refstate
Refstate.SYMBOL	
Description	chemical symbol
Range	2 character field
Refstate.AINUM	
Description	atomic number
Range	positive integer
Refstate.SOA	
Description	Standard Order of Arrangement (Wagman et al., 1983)
Range	positive integer
Refstate.MWT	
Description	molecular weight
Range	positive real number
Refstate.BASIS	
Description	designated basis species for element
Range	Aqueous.NAME where Aqueous.TYPE=basis

Table: SPECIES

Descriptive information about each chemical species

1 row per species.

Species-NAME	
Description	unique species name.
Range	24 character field
Species-TYPE	
Description	species type.
Range	Enumerated: aqueous basis, auxiliary or non-basis aqueous species mineral solid, liquid, gas or solid solution species
Species.DATE	
Description	date of entry/last data change
Range	dd-mmm-yyyy

Table: THERMO

Shows what data exists for each species

Thermo.NAME
  Description primary key
  Range Species.NAME
Thermo.STATUS
  Description output status
  Range Enumerated:
    active
    notused
Thermo.SOURCE
  Description data source
  Range References.SQUIBB
Thermo.GFLAG
  Description data selection flag for DOOUT LOGK calculations
  Range Enumerated:
    0 incomplete data
    1 use GHS.DELG0
    2 use GHS.DELH0 and GHS.SZER0
    3 use LOGK data
    4 use urt data
  ..5 use CP data

Table: URT

Contains URT data

URT.NAME
  Description species name
  Range 24 character field
URT.SOURCE
  Description data source
  Range 10 character field
URT.URT
  Description chemical potential (u/RT)
  Range real number

Appendix C

GEMBOCHS AUDIT TABLE

1st Quarter, 1992

Appendix C: GEMBOCHS Audit Table: 1st Qtr., 1992

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: (PuO2)2(OH)2(aq)				
reactio	coeff	2.000 OH-	-2.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	0.000	2.000 H2O	3/30/92
Comments: new aux set				
Species: (UO2)11(CO3)6(OH)12--				
reactio	coeff	-6.000 H+	-18.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	12.000 OH-	12.000 H2O	3/30/92
Comments: new aux set				
Species: (UO2)2CO3(OH)3-				
reactio	coeff	-1.000 H+	-4.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	3/30/92
Comments: new aux set				
Species: (UO2)3(OH)5CO2+				
reactio	coeff	1.000 CO3--	-1.000 (UO2)3(	3/26/92
Comments: new aux data set				
reactio	coeff	-1.000 (UO2)3(	-4.000 H+	3/26/92
Comments: new aux data set				
reactio	coeff	3.000 UO2++	1.000 HCO3-	3/26/92
Comments: new aux data set				
reactio	coeff	3.500 H2O	3.000 UO2++	3/26/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux data set				
reactio	coeff	0.250 O2(g)	4.000 H2O	3/26/92
Comments: new aux data set				
reactio	coeff	0.000	0.250 O2(g)	3/26/92
Comments: redone aux set				
reactio	coeff	4.000 H2O	3.500 H2O	3/26/92
Comments: redone aux set				

****

Species: Ag(CO3)2---

reactio	coeff	0.000	-2.000 H+	3/26/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92
Comments: new aux set				

****

Species: AgCO3-

reactio	coeff	0.000	-1.000 H+	3/26/92
Comments: new aux data set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	3/26/92
Comments: new aux data set				

****

Species: Al(OH)3(am)

reactio	coeff	0.000	-3.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	3/30/92
Comments: new aux set				

****

Species: Al2(OH)2++++

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-2.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	2.000 OH-	2.000 H2O	3/30/92
Comments: new aux set				

****

Species: Alstonite

reactio	coeff	0.000	-2.000 H+	3/26/92
Comments: new aux data set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92
Comments: new aux data set				

****

Species: Am2(CO3)3

reactio	coeff	0.000	-3.000 H+	3/26/92
Comments: new aux data set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	3/26/92
Comments: new aux data set				

****

Species: AmOH(CO3)2--

reactio	coeff	1.000 OH-	-3.000 H+	3/26/92
Comments: new aux data set				
reactio	coeff	0.000	1.000 H2O	3/26/92
Comments: new aux data set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92
Comments: new aux data set				

****

Species: BF4-

species	type	aqueous	aux	3/27/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: redoing aux species set

****

Species: BaCO3(aq)

reactio	coeff	0.000	-1.000 H+	3/26/92

Comments: new aux species set

reactio	coeff	1.000 CO3--	1.000 HCO3-	3/26/92

Comments: new aux species set

****

Species: Barytocalcite

reactio	coeff	0.000	-2.000 H+	3/26/92

Comments: new aux species set

reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92

Comments: new aux species set

****

Species: Br3-

species	type	aqueous	aux	3/27/92

Comments: redoing aux species set

****

Species: BrO-

species	type	aqueous	aux	3/27/92

Comments: redoing aux species set

****

Species: BrO3-

species	type	aqueous	aux	3/27/92

Comments: redoing aux species set

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: BrO4-

species	type	aqueous	aux	3/27/92
Comments:	redoing basis/aux set			

****

Species: CN-

species	type	aqueous	aux	3/27/92
Comments:	redoing aux species set			
reactio	coeff	1.000 HCO3-	-0.500 O2(g)	3/27/92
Comments:	wolery			
reactio	coeff	1.000 NO3-	-1.000 CN-	3/27/92
Comments:	wolery			
reactio	coeff	1.000 H+	-1.000 H+	3/27/92
Comments:	wolery			
reactio	coeff	-1.000 H2O	-2.000 H2O	3/27/92
Comments:	wolery			
reactio	coeff	-1.000 CN-	1.000 HCO3-	3/27/92
Comments:	wolery			
reactio	coeff	-2.500 O2(g)	1.000 NH4+	3/27/92
Comments:	wolery			

****

Species: CO2(aq)

hmw	type	aux	aqueous	3/24/92
Comments:	changed for hmw data0 only			
species	type	aux	aqueous	3/26/92
Comments:	rewrite of aux set			

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: CO3--				
hmw	type	aux	aqueous	3/24/92
Comments: changed for hmw data0 only				
species	type	aux	aqueous	3/26/92
Comments: new aux species set				
**********				
Species: ClO-				
species	type	aqueous	aux	3/27/92
Comments: redoing aux set				
**********				
Species: ClO2-				
species	type	aqueous	aux	3/27/92
Comments: redoing aux set				
**********				
Species: ClO3-				
species	type	aqueous	aux	3/27/92
Comments: redoing aux species set				
**********				
Species: Cn-				
species	name	Cn-	CN-	3/27/92
Comments: capitalized name incorrect				
**********				
Species: Cu(CO3)2--				
reactio	coeff	0.000	-2.000 H+	3/26/92
Comments: new aux species set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92
Comments: new aux species set				

****

Species: CuCO3(OH)2--

reactio	coeff	-2.000 H+	-3.000 H+	3/26/92
Comments: new aux species set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	3/26/92
Comments: new aux species set				

****

Species: CuCO3(aq)

reactio	coeff	0.000	-1.000 H+	3/26/92
Comments: new aux species set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	3/26/92
Comments: new aux species set				

****

Species: Eu(CO3)2-

reactio	coeff	0.000	-2.000 H+	3/26/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	3/26/92
Comments: new aux set				

****

Species: H2P2O7--

reactio	coeff	-1.000 H2O	-1.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	2.000 H+	1.000 H3P2O7-	3/30/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: H2VO4-

species	type	aqueous	aux	3/27/92
Comments:	redoing aux set			

****

Species: H3P2O7-

species	type	aqueous	aux	3/27/92
Comments:	redoing aux set			

****

Species: HAsS(aq)

species	name	HAsS(aq)	HAsS2(aq)	3/18/92
Comments:	error in name			

****

Species: HO2-

reactio	coeff	0.500 O2(g)	-1.000 H+	3/27/92
Comments:	new aux species set			
reactio	coeff	1.000 OH-	0.500 O2(g)	3/27/92
Comments:	new aux species set			
reactio	coeff	0.000	1.000 H2O	3/27/92
Comments:	new aux species set			

****

Species: HSO3-

reactio	coeff	-0.500 O2(g)	1.000 H+	3/27/92
Comments:	wolery			
reactio	coeff	1.000 H+	1.000 SO3--	3/27/92
Comments:	wolery			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: HSO5-

species type	aqueous	aux	3/27/92
Comments: new aaux set			

****

Species: HSe-

species type	aqueous	aux	3/27/92
Comments: new aux set			

****

Species: HVO4--

reactio coeff	-4.000 H+	-1.000 H+	3/30/92
Comments: new aux set			
reactio coeff	0.250 O2(g)	1.000 H2VO4-	3/30/92
Comments: new aux set			

****

Species: I3-

species type	aqueous	aux	3/30/92
Comments: redoing aux set			

****

Species: IO-

species type	aqueous	aux	3/30/92
Comments: new aux set			

****

Species: IO4-

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
species	type	aqueous	aux	3/30/92
Comments: new aux				

****

Species: MgCO3(aq)

reactio	coeff	1.000 CO3--	-1.000 H+	3/24/92
Comments: written to pure basis				
reactio	coeff	0.000	1.000 HCO3-	3/24/92
Comments: written to pure basis				

****

Species: MgOH+

reactio	coeff	1.000 Mg++	-1.000 H+	3/24/92
Comments: written to pure basis				
reactio	coeff	0.000	1.000 H2O	3/24/92
Comments: written to pure basis				
reactio	coeff	1.000 OH-	1.000 Mg++	3/24/92
Comments: written to pure basis				

****

Species: NH3(aq)

reactio	coeff	-1.000 H2O	-1.000 H+	3/30/92
Comments: wolery				

****

Species: OH-

hmw	type	aux	aqueous	3/24/92
Comments: changed for hmw dat0 only				

****

Species: PbOH+

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	1.000 OH-	-1.000 H+	3/30/92
Comments: redoing aux set				
reactio	coeff	0.000	1.000 H2O	3/30/92
Comments: redoing aux set				

****

Species: S2--

species	type	aqueous	aux	3/30/92
Comments: redoing aux set				

****

Species: S2O3--

species	type	aqueous	aux	3/30/92
Comments: redoing aux set				

****

Species: SO2(aq)

reactio	coeff	1.000 SO4--	1.000 SO3--	3/30/92
Comments: updating aux set				
reactio	coeff	-0.500 O2(g)	2.000 H+	3/30/92
Comments: updating aux set				

****

Species: SiF6--

species	type	aqueous	aux	3/30/92
Comments: redoing aux set				

****

Species: SrCO3(aq)

reactio	coeff	1.000 CO3--	-1.000 H+	3/30/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	1.000 HCO3-	3/30/92
Comments: new aux set				

****

Species: Tl+++

species	type	aqueous	aux	3/30/92
Comments: wolery				

****

Species: UC(alpha)

reactio	coeff	-4.000 H+	-3.000 H+	3/26/92
Comments: redoing aux basis set				
reactio	coeff	2.000 H2O	1.000 H2O	3/26/92
Comments: redoing aux basis set				
reactio	coeff	1.000 CO2(aq)	1.000 HCO3-	3/26/92
Comments: redoing aux basis set				

****

Species: UO2SO4:2H2O

species	name	UO2SO4:2H2O	UO2SO4:3H2O	3/18/92
Comments: error in name				

****

Species: Witherite

reactio	coeff	1.000 Ba++	-1.000 H+	3/30/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 Ba++	3/30/92
Comments: new aux set				
reactio	coeff	0.000	1.000 HCO3-	3/30/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: al(o-phth)+

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: alch3coo++

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: clinoptilolite-hy-ss

species name clinoptilolite Clinoptilolite 3/18/92
Comments: update to caps

****

Species: fe(ch3coo)2+

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: fe(ch3coo)3(aq)

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: fech3coo++

species status active notused 2/24/92
Comments: data needs to be examined

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: nah3sio4(aq)

species	status	active	notused	2/24/92

Comments: doppleganger

Appendix D

GEMBOCHS AUDIT TABLE

D0OUT Suites R10 to R13

Appendix D1: GEMBOCHS Audit Table: D0OUT Suite R10 to R11

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
**********				
Species: ag2o				
species	name		ag2o	9/25/91
Comments:	gt oxide			
**********				
Species: am2o3				
species	name		am2o3	9/25/91
Comments:	gt oxide			
**********				
Species: clinoptilolite-hy-ca				
basic	delg0	-4547.780	-4601.627	5/ 1/91
Comments:	recalculated for hy			
basic	szer0	355.310	355.315	7/12/91
Comments:	new numbers			
reactio	coeff	18.583 h2o	18.579 h2o	10/22/91
Comments:	new numbers			
cp6	t3	-0.000	-0.000	10/22/91
Comments:	updated numbers			
cp6	t2	-0.001	-0.001	10/22/91
Comments:	updated numbers			
basic	delg0	-4601.627	-4588.767	10/22/91
Comments:	updated numbers			
cp6	t1	1.508	1.509	10/22/91
Comments:	updated numbers			
cp6	t0	15.549	15.503	10/22/91
Comments:	updated numbers			
basic	szer0	355.315	354.317	10/22/91
Comments:	updated numbers			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
basic	vzer0	0.000	637.070	10/22/91
Comments: updated numbers				

****

Species: clinoptilolite-hy-cs

basic	delg0	-4568.686	-4315.573	5/ 1/91
Comments: recalculated for hy				
basic	szer0	336.210	336.214	7/12/91
Comments: new numbers				
reactio	coeff	13.168 h2o	13.164 h2o	10/22/91
Comments: new numbers				
cp6	t2	-0.002	-0.002	10/22/91
Comments: new numbers				
cp6	t0	-39.918	-39.964	10/22/91
Comments: new numbers				
basic	delg0	-4315.573	-4302.713	10/22/91
Comments: new numbers				
cp6	t3	0.000	0.000	10/22/91
Comments: new numbers				
cp6	t1	1.585	1.585	10/22/91
Comments: new numbers				
basic	szer0	336.214	336.479	10/22/91
Comments: new numbers				
basic	vzer0	0.000	637.820	10/22/91
Comments: new numbers				

****

Species: clinoptilolite-hy-k

basic	delg0	-4558.181	-4376.834	5/ 1/91
Comments: recalculated for hy				
basic	szer0	333.540	333.542	7/12/91
Comments: new numbers				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	14.434 h2o	14.433 h2o	10/22/91
Comments: new numbers				
cp6	t2	-0.001	-0.001	10/22/91
Comments: new numbers				
cp6	t0	-20.552	-20.563	10/22/91
Comments: new numbers				
basic	delg0	-4376.834	-4364.144	10/22/91
Comments: new numbers				
cp6	t3	0.000	0.000	10/22/91
Comments: new numbers				
cp6	t1	1.571	1.571	10/22/91
Comments: new numbers				
basic	szer0	333.542	333.809	10/22/91
Comments: new numbers				
basic	vzer0	0.000	637.820	10/22/91
Comments: new numbers				

****

Species: clinoptilolite-hy-na

basic	delg0	-4535.926	-4546.476	5/ 1/91
Comments: recalculated for hy				
basic	szer0	359.930	359.935	7/12/91
Comments: new numbers				
reactio	coeff	17.819 h2o	17.819 h2o	7/12/91
Comments: new numbers				
reactio	coeff	17.819 h2o	17.811 h2o	10/29/91
Comments: new data				
cp6	t2	-0.001	-0.001	10/29/91
Comments: new data				
cp6	t_2	-190020.000	-190021.000	10/29/91
Comments: new data				
basic	delg0	-4546.476	-4533.378	10/29/91

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new data				
cp6	t3	0.000	0.000	10/29/91
Comments: new data				
cp6	t1	1.524	1.524	10/29/91
Comments: new data				
cp6	t0	18.127	18.032	10/29/91
Comments: new data				
basic	szer0	359.935	359.835	10/29/91
Comments: new data				
basic	vzer0	0.000	636.410	10/29/91
Comments: new data				

****

Species: clinoptilolite-hy-sr

basic	delg0	-4552.547	-4731.276	5/ 1/91
Comments: recalculated for hy				
basic	szer0	376.440	376.438	7/12/91
Comments: new numbers				
reactio	coeff	20.786 h2o	20.827 h2o	10/29/91
Comments: new data				
cp6	t3	-0.000	-0.000	10/29/91
Comments: new data				
cp6	t2	-0.001	-0.001	10/29/91
Comments: new data				
basic	delg0	-4731.276	-4720.967	10/29/91
Comments: new data				
cp6	t1	1.482	1.482	10/29/91
Comments: new data				
basic	szer0	376.438	375.852	10/29/91
Comments: new data				
cp6	t0	42.175	42.649	10/29/91
Comments: new data				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
basic	vzer0	0.000	633.070	10/29/91
Comments: new data				

****

Species: cs2o

species	name		cs2o	9/25/91
Comments: gt oxide				

****

Species: hbr

species	name		hbr	9/25/91
Comments: gt oxide				

****

Species: hcl

species	name		hcl	9/25/91
Comments: gt oxide				

****

Species: hf

reactio	coeff	0.000	-1.000 hf	10/ 8/91
Comments: oxides need this reaction				
reactio	coeff	0.000	1.000 f-	10/ 8/91
Comments: oxides need this reaction				
reactio	coeff	0.000	1.000 h+	10/ 8/91
Comments: oxides need this reaction				

****

Species: hi

species	name		hi	9/25/91
Comments: gt oxide				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: li2o

species name — li2o — 9/25/91
Comments: gt oxide

****

Species: p2o5

species name — p2o5 — 9/25/91
Comments: gt oxide

****

Species: rao

species name — rao — 9/25/91
Comments: gt oxide

****

Species: rb2o

species name — rb2o — 9/25/91
Comments: gt oxide

****

Species: so3

species name — so3 — 9/25/91
Comments: gt oxide

****

Species: tco2

species name — tco2 — 9/25/91
Comments: gt oxide

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: testadd

species name testadd 7/17/91
Comments:

****

Species: u3o8

species name u3o8 9/25/91
Comments: gt oxide

Appendix D2: GEMBOCHS Audit Table: D0OUT Suite R11 to R12

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: al(o-phth)+

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: alch3coo++

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: fe(ch3coo)2+

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: fe(ch3coo)3(aq)

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: fech3coo++

species status active notused 2/24/92
Comments: data needs to be examined

****

Species: nah3sio4(aq)

species status active notused 2/24/92
Comments: doppelganger

Appendix D3: GEMBOCHS Audit Table: DOOUT Suite R12 to R13

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: HAsS(aq)				
species	name	HAsS(aq)	HAsS2(aq)	3/18/92
Comments: error in name				
Species: UO2SO4:2H2O				
species	name	UO2SO4:2H2O	UO2SO4:3H2O	3/18/92
Comments: error in name				
Species: clinoptilolite-hy-ss				
species	name	clinoptilolite	Clinoptilolite	3/18/92
Comments: update to caps				