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U.S. DEPARTMENT OF ENERGY

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

TECHNICAL DATA BASE QUARTERLY REPORT

APRIL - JUNE 1992

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SITE CHARACTERIZATION PROJECT

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QUARTERLY REPORT

APRIL - JUNE 1992

Prepared by

Technical and Management Support Services
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

SEPDB QUARTERLY REPORT

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 April - June 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 APRIL - JUNE 1992

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

   New Data Available for Project Use

   - DA0158: Thermal Expansion Data for Unsaturated Tuffs from Yucca Mountain, Nevada from SNL report SAND 88-1581.

   - DA0161: Spent Fuel Activity Inventory, Repository Hardware Inventory Characteristics, and Leaching Rates from Activated Spent Fuel Hardware from LLNL (no report referenced).

   - DA0162: Surface Sample Mineralogical Data, USGS report GS.91.M.00042 from the High Level Radioactive Waste Management Proceedings of the Second International Conference.

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

   SEPDB Products (Data Reports)

   SEP0108 - A list of drill holes from which mineralogical samples were taken was sent to Ms. Susan Rohde, EG&G/EM, Las Vegas, NV.

   SEP0109 - A list of all mineralogy data in the SEPDB was sent to Don Livingston, DOE, Las Vegas, NV.

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

SEPDB Data Submittals

- "Uniaxial and Triaxial Compression Test Series on Topopah Springs Tuff", Sandia report SAND82-1723, R. H. Price, SNL.

- "Uniaxial and Triaxial Compression Test Series on Calico Hills Tuff", Sandia report SAND82-1314, R. H. Price, SNL.

- "Uniaxial Compression Test Series on Topopah Spring Tuff from USW GU-3, Yucca Mountain, Southern Nevada", Sandia report SAND83-1646, R. H. Price, SNL.

- "Preliminary Characterization of the Petrologic, Bulk, and Mechanical Properties of a Lithophysal Zone Within the Topopah Spring Member of the Paintbrush Tuff", Sandia report SAND84-0860, R. H. Price, SNL.

4. The transition of the SEPDB to GENISES has begun. In a letter from R. P. Sandoval, SNL, to C. M. Newbury, DOE, dated June 3, 1992, a transition plan was recommended that would have the SEPDB officially transferred by September 30, 1992. The basis for prioritizing the data being transferred is found in a letter from J. Beckett, EG&G, to R. Orzel, SNL, dated March 19, 1992. A data cartridge containing the primary priority tables as defined in that letter was sent to EG&G on June 5 and was successfully loaded into the GENISES database. Those tables contain porosity, pore saturation, natural-state pore-water content percentages, rock and mineral constituents, grain density and hydraulic conductivity data. On June 17, a second data cartridge containing the secondary priority tables was sent to EG&G. The second cartridge contained thermal conductivity, transmissivity data and pumping conditions, well test hydraulic conductivity measurements, water chemical constituents and relative hydraulic conductivity data. Once Sandia receives verification reports from EG&G that compare identically to those generated by Sandia, they will be enclosed into the job file at Sandia and closed out. It is anticipated that a data cartridge containing the remaining tables (approximately 50) will be sent to EG&G by July 15, 1992.

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
		USGS WRIR 84-4248
	Water Chemical Constituent Values for Drill Holes	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

	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

NNWSI Hole Histories, Unsaturated Zone - Neutron Holes, 76 Boreholes drilled between May 1984 and February 1986, DOE/NV/10322-21

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

NNWSI Hole Histories UE-25a #1, UE-25a #3, UE-25a #4, UE-25a #5, UE-25a #6, UE-25a#7, DOE/NV/10322-9

Anderson, L. A., "Rock Property Analysis of Core Samples from the Yucca Mountain UE-25a #1 Borehole, Nevada Test Site, Nevada," USGS OFR 81-1338, 1981

Anderson, L. A., "Rock property measurements on large-volume core samples from Yucca Mountain USW GU-3/G-3 and USW G-4 boreholes, Nevada Test Site, Nevada," USGS OFR 84-552, 1984

Benson, L. V., Robison, J. H., Blankennagel, R. K. and Ogard, A. E., "Chemical Composition of Ground Water and the Locations of Permeable Zones in the Yucca Mountain Area, Nevada," USGS OFR 83-854, 1983

Bentley, C. B., "Geohydrologic Data for Test Well USW G-4, Yucca Mountain Area, Nye County, Nevada," USGS OFR 84-063, 1984

Bentley, C. B., Robison, J. H. and Spengler, R. W., "Geohydrologic Data for Test Well USW H-5, Yucca Mountain Area, Nye County, Nevada," USGS OFR 83-853, 1983

Bish, D. L. and Chipera, S. J., "Revised Mineralogic Summary of Yucca Mountain, Nevada," LA-11497-MS, 1989

Carlos, B. A., "Minerals in Fractures of the Saturated Zone from Drill Core USW G-4, Yucca Mountain, Nye County, Nevada," LA-10927-MS, 1987

Carr, M. D., Waddell, S. J., Vick, G. S., Stock, J. M., Monsen, S. A., Harris, A. G., Cork, B. S. and Byers, F. M., Jr., "Geology of Drill Hole UE-25p#1: A Test Hole to Pre-Tertiary rocks near Yucca Mountain, Southern Nevada," USGS OFR 86-175, 1986

Carr, W. J. and Parrish, L. D., "Geology of drill hole USW VH-2, and structure of Crater Flat, Southwestern Nevada," USGS OFR 85-475, 1985

Carr, W. J., "Volcano-tectonic history of Crater Flat, Southwestern Nevada, as suggested by new evidence from drill hole USW-VH-1 and vicinity," USGS OFR 82-457, 1982

Connolly, J. R. and Nimick, F. B., "Mineralogic and Chemical Data Supporting Heat Capacity Determination for Tuffaceous Rocks," SAND88-0882, 1988

Craig, R. W. and Johnson, K. A., "Geohydrologic Data for Test Well UE-25p #1, Yucca Mountain Area, Nye County, Nevada," USGS OFR 84-450, 1984

Craig, R. W. and Robison, J. H., "Geohydrology of Rocks Penetrated by Test Well UE-25p #1, Yucca Mountain Area, Nye County, Nevada," USGS WRIR 84-4248, 1984

Craig, R. W., Reed, R. L. and Spengler, R. W., "Geohydrologic Data for Test Well USW H-6, Yucca Mountain Area, Nye County, Nevada," USGS OFR 83-856, 1983

Dinwiddie, G. A. and Weir, J. E., Jr., "Summary of Hydraulic Tests and Hydrologic Data for Holes UE-16d and UE-16f, Syncline Ridge Area, Nevada Test Site," USGS 1543-3, 1979

Holmes & Narver, Inc., "Borrow Pit Material Evaluation, ES Auxillary Pads, Area 25, WBS# 1.2.6.2.1.2, QA Level III," NTS:TEC:MTL:89-72, 1989

Knauss, K. G. and Peifer, D. W., "Reaction of Vitric Topopah Spring Tuff and J-13 Ground Water Under Hydrothermal Conditions Using Dickson-Type, Gold-Bag Rocking Autoclaves," UCRL-53795, 1986

Knauss, K. G., Beiriger, W. J. and Peifer, D. W., "Hydrothermal Interaction of Solid Wafers of Topopah Spring Tuff with J-13 Water and Distilled Water at 90, 150, and 250°C, Using Dickson-Type, Gold-Bag Rocking Autoclaves," UCLR-53645, 1985

Lahoud, R. G., Lobmeyer, D. H. and Whitfield, M. S., Jr., "Geohydrology of Volcanic Tuff Penetrated by Test Well UE-25b #1, Yucca Mountain, Nye County, Nevada," USGS WRIR 84-4253, 1984

Lin, W. and Daily, W., "Transport Properties of Topopah Spring Tuff," UCRL-53602, 1984

Lobmeyer, D. H., "Geohydrology of Rocks Penetrated by Test Well USW G-4, Yucca Mountain, Nye County, Nevada," USGS WRIR 86-4015, 1986

Lobmeyer, D. H., Whitfield, M. S., Jr., Lahoud, R. R. and Bruckheimer, L., "Geohydrologic Data for Test Well UE-25b #1, Nevada Test Site, Nye County, Nevada," USGS OFR 83-855, 1983

Maldonado, F. and Koether, S. L., "Stratigraphy, structure, and some Petrographic Features of Tertiary Volcanic Rocks at the USW G-2 Drill Hole, Yucca Mountain, Nye County, Nevada," USGS OFR 83-732, 1983

Milne, W. K., Benson, L. V. and McKinley, P. W., "Isotope Content and Temperature of Precipitation in Southern Nevada, August 1983 - August 1986," USGS OFR 87-463, 1987

Nimick, F. B., "Thermal Conductivity Data for Tuffs from the Unsaturated Zone at Yucca Mountain, Nevada," SAND88-0624, unpublished

Nimick, F. B., Van Buskirk, R. G. and McFarland, A. F., "Uniaxial and Triaxial Compression Test Series on the Topopah Spring Member from USW G-2, Yucca Mountain, Nevada," SAND85-0703, 1987

Ortiz, T. S., Williams, R. L., Nimick, F. B., Whittet, B. C. and South, D. L., "A Three-Dimensional Model of Thermal/Mechanical and Hydrologic Stratigraphy at Yucca Mountain, Southern Nevada," SAND84-1076, 1985

Pedalino, J. P., "Revisions & Additions to TUFFDB Product No. 24 (replicates SEPDB hole info table)," NNWSI:TPO:87-096, 1987

Price, R. H., Connolly, J. R. and Keil, K., "Petrologic and Mechanical Properties of Outcrop Samples of the Welded, Devitrified Topopah Spring Member of the Paintbrush Tuff," SAND86-1131, 1987

Rautman, C. A., "Estimates of Spatial Correlation in Volcanic Tuff, Yucca Mountain, Nevada," SAND89-2270, 1990

Robison, J. H., "Ground-Water Level Data and Preliminary Potentiometric-Surface Maps, Yucca Mountain and Vicinity, Nye County, Nevada," USGS WRIR 84-4197, 1984

Robison, J. H., Stephens, D. M., Luckey, R. R. and Baldwin, D. A., "Water Levels in Periodically Measured Wells in the Yucca Mountain Area, Nevada, 1981-87," USGS OFR 88-468, 1984

Rosenbaum, J. G. and Rivers, W. C., "Paleomagnetic Orientation of Core from Drill Hole USW GU-3 Yucca Mountain, Nevada: Tiva Canyon Member of the Paintbrush Tuff," USGS OFR 85-48, 1984

Rush, F. E., Thordarson, W. and Pyles, D. G., "Geohydrology of Test Well USW H-1, Yucca Mountain, Nye County, Nevada," USGS WRIR 84-4032, 1984

Rutherford, B. M., Hall, I. J., Easterling, R. G., Peters, R. R. and Klavetter, E. A., "Statistical Analysis of Hydrologic Data for Yucca Mountain," SAND87-2380, 1989

Schwartz, B. M., "Density and Porosity Data for Tuffs from the Unsaturated Zone at Yucca Mountain, Nevada," SAND88-0811, 1989

Scott, R. B. and Castellanos, M., "Stratigraphic and Structural Relations of Volcanic Rocks in Drill Holes USW GU-3 and USW G-3, Yucca Mountain, Nye County, Nevada," USGS OFR 84-491, 1984

Sheppard, R. A., Gude, A. J., 3rd and Fitzpatrick, J. J., "Distribution, Characterization, and Genesis of Mordenite in Miocene Silicic Tuffs at Yucca Mountain, Nye County, Neveda," USGS BULL-1777, 1988

Spengler, R. W., Byers, F. M., Jr. and Warner, J. B., "Stratigraphy and structure of volcanic rocks in drill hole USW-G1, Yucca Mountain, Nye County, Nevada," USGS OFR 81-1349, 1981

Spengler, R. W., Chornack, M. P., Muller, D. C. and Kibler, J. E., "Stratigraphic and Structural Characteristics of Volcanic Rocks in Core Hole USW G-4, Yucca Mountain, Nye County, Nevada," USGS OFR 84-789, 1984

Squires, R. R. and Young, R. L., "Flood Potential of Fortymile Wash and its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada," USGS WRIR 83-4001, 1984

Tarr, A. C. and Rogers, A. M., "Analysis of Earthquake Data Recorded by Digital Field Seismic Systems, Jackass Flats, Nevada," USGS OFR 86-420, 1986

Thordarson, W. and Howells, L., "Hydraulic Tests and Chemical Quality of Water at Well USW VH-1, Crater Flat, Nye County, Nevada," USGS WRIR 86-4359, 1987

Thordarson, W., "Geohydrologic Data and Test Results from Well J-13, Nevada Test Site, Nye County, Nevada," USGS WRIR 83-4171, 1983

Thordarson, W., Rush, F. E. and Waddell, S. J., "Geohydrology of Test Well USW H-3, Yucca Mountain, Nye County, Nevada," USGS WRIR 84-4272, 1985

Waddell, R. K., Jr., "Hydrologic and Drill-hole Data for Test Wells UE-29a #1 and UE-29a #2, Fortymile Canyon, Nevada Test Site," USGS OFR 84-142, 1984

Walck, M. C. and Phillips, J. S., "Two-Dimensional Velocity Models for Paths From Pahute Mesa and Yucca Flat to Yucca Mountain," SAND88-3033, 1990

Weeks, E. P. and Wilson, W. E., "Preliminary Evaluation of Hydrologic Properties of Cores of Unsaturated Tuff, Test Well USW H-1, Yucca Mountain, Nevada," USGS WRIR 84-4193, 1984

Weir, J. E., Jr. and Hodson, J. N., "Geohydrology of Hole UE-17a, Syncline Ridge Area, Nevada Test Site," USGS 1543-4, 1979

Whitfield, M. S., Jr., Eshom, E. P., Thordarson, W. and Schaefer, D. H., "Geohydrology of Rocks Penetrated by Test Well USW H-4, Yucca Mountain, Nye County, Nevada," USGS WRIR 85-4030, 1985

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)

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 drill hole'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)

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)

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)

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)

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) 166.0 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]		8.5	8.6	13.6	18.6	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)	PRETEST SAMPLE MASS (g)	POSTTEST 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-KEY ID 51/LB13-2/1/78

SNL DATA REPORT NUMBER SAND88-1581

THIS DCF COMPLETED BY Barry Schwartz — Name; 6313 — SNL Div.; 1/25/88 — Date

a. To obtain thermal expansion coefficients in units of 10^{-6}°F^{-1}, multiply by 5/9.

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

TMP 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: 250
Date Received: 5/24/91
Product QA Level: B
Data QA Level: TBD

TO BE COMPLETED BY REQUESTOR:

Name: Stephen J Bauer Signature: [signature]

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: N/A

uniaxial and triaxial strength data with elastic properties

For all units at Yucca Mtn

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

also any other attributes such as porosity.

TO BE COMPLETED BY DATA BASE PERSONNEL

Type: Data Entry ___ Product Request ✓ Other ___

Accepted By: [signature] Date: 5/24/91
Assigned To: [signature] Date: 5/24/91
Verified By: [signature] Date: 6/7/91
Approved By: [signature] 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 (mbllll)	POISSONS RATIO	YOUNG'S MODULUS (GPa)	(E) AXIAL STRENGTH (mbllll)	PRO 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	59.9	2.2	2	4.00	2.330	2.370	-	2.450	TSW	TSw1
797.00	G2-797.0-A	162.0	3.0	0.25	49.5	3.0	A	4.00	2.340	2.380	-	2.440	TSW	TSw1
797.00	G2-797.0-B	130.0	3.6	0.26	39.6	3.6	B	3.00	2.340	2.390	-	2.450	TSW	TSw1
810.40	G2-810.4-A	160.0	3.3	0.24	37.0	3.3	A	3.00	2.360	2.390	-	2.430	TSW	TSw1
940.40	G2-940.4-C	157.0	3.3	0.26	49.0	3.3		-	-	-	-	-	TSW	TSw1
940.40	G2-940.4-A	167.0	4.6	0.30	43.0	4.6	A	8.00	2.310	2.390	-	2.510	TSW	TSw1
940.40	G2-940.4-B	113.0	3.0	0.26	41.9	3.0	B	10.00	2.200	2.300	-	2.530	TSW	TSw1
940.40	G2-940.4-D	117.0	3.2	0.26	43.1	3.2	D	8.00	2.290	2.370	-	2.490	TSW	TSw1
949.60	G2-949.6-C	220.0	6.2	0.19	38.6	6.2	C	7.00	2.300	2.370	-	2.470	TSW	TSw1
949.00	G2-949.0-A	190.0	5.6	-	60.2	5.6	A	7.00	2.330	2.400	-	2.510	TSW	TSw1
949.00	G2-949.0-B	210.0	4.0	0.21	46.3	4.0	B	8.00	2.310	2.390	-	2.510	TSW	TSw1
949.00	G2-949.0-D	157.0	3.1	0.24	54.7	3.1	D	8.00	2.300	2.380	-	2.500	TSW	TSw1
1297.60	G2-1297.6-A	3.0	1.6	-	-	-	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
1326.30		-	-	-	-	-		11.46	2.240	-	2.350	2.530	TSW	TSw1
1359.00		-	-	-	-	-		16.21	2.120	-	2.280	2.530	TSW	TSw2
1561.30	G2-1561.3-A	85.0	4.7	0.11	22.1	4.7	A	10.00	2.240	2.340	-	2.490	TSW	TSw2
1561.30	G2-1561.3-C	73.0	4.1	0.17	22.0	4.1	C	10.00	2.240	2.340	-	2.510	TSW	TSw2
1561.30	G2-1561.3-D	86.0	4.1	-	22.7	4.1	D	10.00	2.260	2.360	-	2.510	TSW	TSw2
1561.30	G2-1561.3-E	61.0	3.7	-	23.6	3.7	E	12.00	2.210	2.330	-	2.250	TSW	TSw2
1579.10	G2-1579.1-A	170.0	5.6	0.17	33.9	5.6	A	9.00	2.300	2.390	-	2.530	TSW	TSw2
1579.10	G2-1579.1-C	97.0	6.3	0.10	10.0	6.3	C	14.00	2.150	2.290	-	2.500	TSW	TSw2
1579.10	G2-1579.1-D	175.0	6.1	0.17	31.0	6.1	D	9.00	2.200	2.370	-	2.510	TSW	TSw2
1579.10	G2-1579.1-E	96.0	5.0	0.19	30.5	5.0	E	12.00	2.230	2.350	-	2.530	TSW	TSw2
1580.40		-	-	-	-	-	24	19.20	2.106	2.204	-	2.602	TSW	TSw2
1582.60		-	-	-	-	-	25	11.60	2.294	2.390	-	2.594	TSW	TSw2
1587.00	G2-1587.0-B	145.0	6.1	0.20	35.0	6.1	B	9.00	2.300	2.390	-	2.530	TSW	TSw2
1587.00	G2-1587.0-D	155.0	5.5	0.16	33.3	5.5	D	7.00	2.330	2.400	-	2.510	TSW	TSw2
1600.00		-	-	-	-	-	26	16.70	2.107	2.270	-	2.520	TSW	TSw2
1600.70		-	-	-	-	-	27B	15.20	2.154	2.304	-	2.542	TSW	TSw2
1600.70		-	-	-	-	-	27A	14.20	2.191	2.324	-	2.553	TSW	TSw2
1619.00		-	-	-	-	-	28	11.10	2.301	2.402	-	2.587	TSW	TSw2
1624.10		-	-	-	-	-	29	11.10	2.234	2.319	-	2.515	TSW	TSw2
1628.50		-	-	-	-	-	30	16.00	2.206	2.325	-	2.627	TSW	TSw2
1646.00	G2-1646.0-B	22.0	3.0	-	-	-		-	-	-	-	-	TSW	TSw2
1646.00	G2-1646.0-C	27.0	5.0	-	-	-		-	-	-	-	-	TSW	TSw2
1659.20	G2-1659.2-B	53.0	4.6	-	-	-		-	-	-	-	-	TSW	TSw2
1659.20	G2-1659.2-A	69.0	5.3	-	-	-	A	4.00	2.370	2.310	-	2.340	TSW	TSw2
1725.05	G2-1725.05-A	22.0	3.9	0.24	6.3	3.9		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1725.05	G2-1725.05-C	29.0	4.0	0.10	8.5	4.0		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1740.00	G2-1740.0-A	29.0	2.5	0.10	14.2	2.5		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1740.00	G2-1740.0-B	27.0	3.2	-	11.2	3.2		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1740.00	G2-1740.0-C	25.0	3.4	0.22	11.0	3.4		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1740.00	G2-1740.0-E	25.0	3.5	0.23	11.2	3.5		-	-	-	-	-	Bedded Tuff below TSW	CHnlu
1740.00	G2-1740.0-F	28.0	4.3	0.11	11.1	4.3		-	-	-	-	-	Bedded Tuff below TSW	CHnlu

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NOTES: CE SAMPLE ID are the sample identifications associated with the compressive strength, poissons ratio and young's modulus fields.
PRO 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.

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

June 6, 1991 SEPDB PRODUCT NUMBER: SEP0093

SUPPORTING COMPRESSIVE STRENGTH DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0068
SUBMITTAL CITATION NUMBER: SAND85-0783
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	50.0 mm	9,17	51/L02-3/30/84
797.00	G2-797.0-2	125.0	3.2	0	1e-05 /sec	101.7 mm	50.9 mm	9,17	51/L02-3/30/84
797.00	G2-797.0-A	142.0	3.8	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
797.00	G2-797.0-B	126.0	3.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
818.40	G2-818.4-A	168.0	5.3	0	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L02-3/30/84
948.40	G2-948.4-A	167.0	4.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
948.40	G2-948.4-B	115.0	3.0	0	1e-07 /sec	50.8 mm	25.2 mm	9,17	51/L02-3/30/84
948.40	G2-948.4-C	137.0	3.3	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
948.40	G2-948.4-D	117.0	3.2	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
949.60	G2-949.6-C	228.0	6.2	0	1e-05 /sec	50.7 mm	25.3 mm	9,17	51/L02-3/30/84
969.00	G2-969.0-A	130.0	3.6	0	1e-05 /sec	50.8 mm	25	9,17	51/L02-3/30/84
969.00	G2-969.0-B	210.0	4.8	0	1e-05 /sec	50.8 mm	2	9,17	51/L02-3/30/84
969.00	G2-969.0-D	157.0	3.1	0	1e-05 /sec	101.7 mm	[illegible] mm	9,17	51/L02-3/30/84
1297.60	G2-1297.6-A	3.0	1.4	0	1e-05 /sec	50.8 mm	25.2 mm	9,17	51/L02-3/30/84
1297.60	G2-1297.6-B	7.0	2.4	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1361.30	G2-1361.3-A	85.0	4.7	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1361.30	G2-1361.3-C	73.0	4.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1361.30	G2-1361.3-D	86.0	4.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1361.30	G2-1361.3-E	61.0	3.7	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1379.10	G2-1379.1-A	170.0	5.6	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1379.10	G2-1379.1-C	97.0	6.3	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1379.10	G2-1379.1-D	175.0	6.1	0	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L02-3/30/84
1379.10	G2-1379.1-E	96.0	5.0	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1587.00	G2-1587.0-B	163.0	6.1	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1587.00	G2-1587.0-D	133.0	5.5	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1646.00	G2-1646.0-B	32.0	3.0	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1646.00	G2-1646.0-C	27.0	3.0	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1659.20	G2-1659.2-A	60.0	5.3	10	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1659.20	G2-1659.2-B	53.0	4.6	10	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1725.05	G2-1725.05-A	22.0	3.9	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1725.05	G2-1725.05-C	29.0	4.0	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1748.00	G2-1748.0-A	28.0	2.5	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1748.00	G2-1748.0-C	23.0	3.4	0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1748.00	G2-1748.0-D	27.0	3.2	0	1e-07 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1748.00	G2-1748.0-E	35.0	3.5	0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1748.00	G2-1748.0-F	28.0	4.3	0	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84

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

SUPPORTING ELASTIC PROPERTIES DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0008
SUBMITTAL CITATION NUMBER: SAND85-0783
SUBMITTAL TITLE: Uniaxial and Triaxial Compression Test Series on the Topopah Spring Member from USW G-2, Yucca Mountain, Nevada
DATA QA LEVEL: NQ

DEPTH (ft)	SAMPLE ID	YOUNG'S MODULUS (GPa)	POISSONS RATIO	AXIAL STRENGTH (mPa)	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	51/L02-3/30/84
797.00	G2-797.0-2	39.9	0.31	2.2	1e-05 /sec	101.7 mm	50.9 mm	9,17	51/L02-3/30/84
797.00	G2-797.0-A	43.3	0.25	3.8	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
797.00	G2-797.0-B	39.6	0.26	3.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
810.40	G2-810.4-A	37.8	0.24	5.3	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L02-3/30/84
940.40	G2-940.4-A	42.0	0.30	4.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
940.40	G2-940.4-B	41.9	0.26	3.0	1e-07 /sec	50.8 mm	25.2 mm	9,17	51/L02-3/30/84
940.40	G2-940.4-C	49.0	0.26	3.3	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
940.40	G2-940.4-D	42.1	0.26	3.2	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
949.60	G2-949.6-C	30.6	0.19	6.2	1e-05 /sec	50.7 mm	25.3 mm	9,17	51/L02-3/30/84
969.00	G2-969.0-A	60.3	-	2.6	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
969.00	G2-969.0-B	46.3	0.21	4.0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
969.00	G2-969.0-D	54.7	0.34	3.1	1e-05 /sec	101.7 mm	50.9 mm	9,17	51/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	51/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	51/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	51/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	51/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	51/L02-3/30/84
1579.10	G2-1579.1-C	10.0	0.10	6.3	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1579.10	G2-1579.1-D	31.0	0.17	6.1	1e-05 /sec	50.9 mm	25.2 mm	9,17	51/L02-3/30/84
1579.10	G2-1579.1-E	20.5	0.19	5.0	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/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	51/L02-3/30/84
1587.00	G2-1587.0-D	35.3	0.16	5.5	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1725.05	G2-1725.05-A	6.3	0.24	3.9	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1725.05	G2-1725.05-C	8.5	0.10	4.0	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1740.00	G2-1740.0-A	14.2	0.10	2.5	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1740.00	G2-1740.0-C	11.6	0.22	3.4	1e-05 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1740.00	G2-1740.0-D	11.2	-	3.2	1e-07 /sec	50.9 mm	25.3 mm	9,17	51/L02-3/30/84
1740.00	G2-1740.0-E	11.2	0.23	3.5	1e-05 /sec	50.8 mm	25.3 mm	9,17	51/L02-3/30/84
1740.00	G2-1740.0-F	11.1	0.11	4.3	1e-07 /sec	50.8 mm	25.3 mm	9,17	51/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

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

SUPPORTING POROSITY DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DA0042
SUBMITTAL CITATION NUMBER: SAND90-0511
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	[illegible]	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-4	31/L82-3/30/84
797.0	2	4.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-4	31/L82-3/30/84
797.0	A	4.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-3	31/L82-3/30/84
797.0	B	5.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-3	31/L82-3/30/84
815.4	A	3.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-5	31/L82-3/30/84
948.4	A	8.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-5	31/L82-3/30/84
948.4	B	10.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-6	31/L82-3/30/84
948.4	D	8.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-6	31/L82-3/30/84
949.6	C	7.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-7	31/L82-3/30/84
969.0	A	7.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-7	31/L82-3/30/84
969.0	B	6.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-8	31/L82-3/30/84
969.0	D	8.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-8	31/L82-3/30/84
1297.6	A	22.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-9	31/L82-3/30/84
1297.6	B	24.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-9	31/L82-3/30/84
1326.3		11.46	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-10	31/L83-9/7/83
1339.0		16.21	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-10	31/L83-9/7/83
1361.3	A	10.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-11	31/L82-3/30/84
1361.3	C	10.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-11	31/L82-3/30/84
1361.3	D	10.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-12	31/L82-3/30/84
1361.3	E	12.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-12	31/L82-3/30/84
1379.1	A	9.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-13	31/L82-3/30/84
1379.1	C	14.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-13	31/L82-3/30/84
1379.1	D	9.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-14	31/L82-3/30/84
1379.1	E	12.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-14	31/L82-3/30/84
1380.4	24	19.10	matrix, [illegible]/GD)]	ambient	ambient	C-15	31/L83-1/18/85
1382.6	25	11.40	matrix, [illegible]/GD)]	ambient	ambient	C-15	31/L83-1/18/85
1387.0	B	9.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-16	31/L82-3/30/84
1387.0	D	7.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-16	31/L82-3/30/84
1400.0	26	16.70	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-17	31/L83-1/18/85
1408.7	27A	14.20	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-17	31/L83-1/18/85
1408.7	27B	13.20	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-18	31/L83-1/18/85
1413.9	28	11.10	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-18	31/L83-1/18/85
1424.1	29	11.10	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-19	31/L83-1/18/85
1428.5	30	16.00	matrix, 100[1-(DBD/GD)]	ambient	ambient	C-19	31/L83-1/18/85
1439.2	A	4.00	matrix, 100(SBD-DBD)/MD	ambient	ambient	C-20	31/L82-3/30/84

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

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

SUPPORTING BULK DENSITY 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	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	483.69 g	C-4	51/L02-3/30/84
797.0	1	2.370	saturated	caliper	ambient	ambient	489.21 g	C-4	51/L02-3/30/84
797.0	2	2.330	dry	caliper	ambient	ambient	481.50 g	C-4	51/L02-3/30/84
797.0	2	2.370	saturated	caliper	ambient	ambient	489.05 g	C-4	51/L02-3/30/84
797.0	A	2.340	dry	caliper	ambient	ambient	59.67 g	C-3	51/L02-3/30/84
797.0	A	2.380	saturated	caliper	ambient	ambient	60.71 g	C-3	51/L02-3/30/84
797.0	B	2.340	dry	caliper	ambient	ambient	60.12 g	C-3	51/L02-3/30/84
797.0	B	2.390	saturated	caliper	ambient	ambient	60.87 g	C-3	51/L02-3/30/84
810.4	A	2.340	dry	caliper	ambient	ambient	59.89 g	C-5	51/L02-3/30/84
810.4	A	2.390	saturated	caliper	ambient	ambient	60.80 g	C-5	51/L02-3/30/84
940.4	A	2.310	dry	caliper	ambient	ambient	58.89 g	C-5	51/L02-3/30/84
940.4	A	2.390	saturated	caliper	ambient	ambient	60.84 g	C-5	51/L02-3/30/84
940.4	B	2.280	dry	caliper	ambient	ambient	57.98 g	C-6	51/L02-3/30/84
940.4	B	2.380	saturated	caliper	ambient	ambient	60.38 g	C-6	51/L02-3/30/84
940.4	D	2.290	dry	caliper	ambient	ambient	58.48 g	C-6	51/L02-3/30/84
940.4	D	2.370	saturated	caliper	ambient	ambient	60.41 g	C-6	51/L02-3/30/84
949.6	C	2.300	dry	caliper	ambient	ambient	58.53 g	C-7	51/L02-3/30/84
949.6	C	2.370	saturated	caliper	ambient	ambient	60.34 g	C-7	51/L02-3/30/84
969.0	A	2.330	dry	caliper	ambient	ambient	59.33 g	C-7	51/L02-3/30/84
969.0	A	2.400	saturated	caliper	ambient	ambient	61.10 g	C-7	51/L02-3/30/84
969.0	B	2.310	dry	caliper	ambient	ambient	58.86 g	C-8	51/L02-3/30/84
969.0	B	2.390	saturated	caliper	ambient	ambient	60.85 g	C-8	51/L02-3/30/84
969.0	D	2.300	dry	caliper	ambient	ambient	475.61 g	C-8	51/L02-3/30/84
969.0	D	2.380	saturated	caliper	ambient	ambient	492.02 g	C-8	51/L02-3/30/84
1297.6	A	1.940	dry	caliper	ambient	ambient	49.28 g	C-9	51/L02-3/30/84
1297.6	A	2.160	saturated	caliper	ambient	ambient	54.03 g	C-9	51/L02-3/30/84
1297.6	B	1.900	dry	caliper	ambient	ambient	48.66 g	C-9	51/L02-3/30/84
1297.6	B	2.140	saturated	caliper	ambient	ambient	54.76 g	C-9	51/L02-3/30/84
1526.3		2.240	dry	immersion	ambient	ambient	73.996 g	C-10	51/L03-9/7/82
1526.3		2.250	natural	immersion	ambient	ambient	77.620 g	C-10	51/L03-9/7/82
1559.0		2.120	dry	immersion	ambient	ambient	43.016 g	C-10	51/L03-9/7/82
1559.0		2.200	natural	immersion	ambient	ambient	46.260 g	C-10	51/L03-9/7/82
1561.3	A	2.240	dry	caliper	ambient	ambient	57.01 g	C-11	51/L02-3/30/84
1561.3	A	2.340	saturated	caliper	ambient	ambient	59.72 g	C-11	51/L02-3/30/84
1561.3	C	2.260	dry	caliper	ambient	ambient	57.59 g	C-11	51/L02-3/30/84
1561.3	C	2.360	saturated	caliper	ambient	ambient	60.12 g	C-11	51/L02-3/30/84
1561.3	D	2.260	dry	caliper	ambient	ambient	57.67 g	C-12	51/L02-3/30/84
1561.3	D	2.360	saturated	caliper	ambient	ambient	60.11 g	C-12	51/L02-3/30/84
1561.3	E	2.210	dry	caliper	ambient	ambient	56.70 g	C-12	51/L02-3/30/84
1561.3	E	2.330	saturated	caliper	ambient	ambient	59.43 g	C-12	51/L02-3/30/84
1579.1	A	2.300	dry	caliper	ambient	ambient	58.59 g	C-13	51/L02-3/30/84
1579.1	A	2.390	saturated	caliper	ambient	ambient	60.81 g	C-13	51/L02-3/30/84
1579.1	C	2.150	dry	caliper	ambient	ambient	55.15 g	C-13	51/L02-3/30/84

NOTE: Sample Length and Sample Diameter not given for US

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

SUPPORTING BULK DENSITY DATA FOR DRILL HOLE USW G-2 SEP0012

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
1379.1	C	2.290	saturated	caliper	ambient	ambient	58.80 g	C-13	51/L02-3/30/84
1379.1	D	2.288	dry	caliper	ambient	ambient	57.88 g	C-14	51/L02-3/30/84
1379.1	D	2.370	saturated	caliper	ambient	ambient	60.19 g	C-14	51/L02-3/30/84
1379.1	E	2.230	dry	caliper	ambient	ambient	56.93 g	C-14	51/L02-3/30/84
1379.1	E	2.350	saturated	caliper	ambient	ambient	59.85 g	C-14	51/L02-3/30/84
1380.4	24	2.186	dry	immersion	ambient	ambient	47.682 g	C-15	51/L03-1/18/85
1380.4	24	2.284	saturated	immersion	ambient	ambient	51.047 g	C-15	51/L03-1/18/85
1382.6	25	2.294	dry	immersion	ambient	ambient	153.967 g	C-15	51/L03-1/18/85
1382.6	25	2.390	saturated	immersion	ambient	ambient	159.424 g	C-15	51/L03-1/18/85
1387.8	D	2.380	dry	caliper	ambient	ambient	58.70 g	C-16	51/L02-3/30/84
1387.8	D	2.390	saturated	caliper	ambient	ambient	60.80 g	C-16	51/L02-3/30/84
1387.8	D	2.330	dry	caliper	ambient	ambient	59.33 g	C-16	51/L02-3/30/84
1387.8	D	2.400	saturated	caliper	ambient	ambient	61.23 g	C-16	51/L02-3/30/84
1400.8	26	2.187	dry	immersion	ambient	ambient	161.117 g	C-17	51/L03-1/18/85
1400.8	26	2.270	saturated	immersion	ambient	ambient	173.575 g	C-17	51/L03-1/18/85
1400.7	27A	2.191	dry	immersion	ambient	ambient	70.869 g	C-17	51/L03-1/18/85
1400.7	27A	2.324	saturated	immersion	ambient	ambient	75.123 g	C-17	51/L03-1/18/85
1400.7	27B	2.156	dry	immersion	ambient	ambient	66.377 g	C-18	51/L03-1/18/85
1400.7	27B	2.384	saturated	immersion	ambient	ambient	70.914 g	C-18	51/L03-1/18/85
1413.9	28	2.301	dry	immersion	ambient	ambient	74.829 g	C-18	51/L03-1/18/85
1413.9	28	2.482	saturated	immersion	ambient	ambient	82.484 g	C-18	51/L03-1/18/85
1424.1	29	2.236	dry	immersion	ambient	ambient	109.724 g	C-19	51/L03-1/18/85
1424.1	29	2.319	saturated	immersion	ambient	ambient	113.799 g	C-19	51/L03-1/18/85
1428.5	30	2.286	dry	immersion	ambient	ambient	131.315 g	C-19	51/L03-1/18/85
1428.5	30	2.355	saturated	immersion	ambient	ambient	140.170 g	C-19	51/L03-1/18/85
1430.2	A	2.270	dry	caliper	ambient	ambient	57.76 g	C-20	51/L02-3/30/84
1430.2	A	2.310	saturated	caliper	ambient	ambient	58.83 g	C-20	51/L02-3/30/84

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

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

SUPPORTING GRAIN DENSITY DATA FOR DRILL HOLE USW G-2

DATA AUTHORIZATION NUMBER: DAD042
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	2.400	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-4	51/L02-3/30/84
797.0	2	2.430	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-4	51/L02-3/30/84
797.0	A	2.440	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-3	51/L02-3/30/84
797.0	B	2.430	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-3	51/L02-3/30/84
810.4	A	2.430	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-5	51/L02-3/30/84
940.4	A	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-5	51/L02-3/30/84
940.4	B	2.530	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-6	51/L02-3/30/84
940.4	D	2.490	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-6	51/L02-3/30/84
949.6	C	2.470	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-7	51/L02-3/30/84
969.0	A	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-7	51/L02-3/30/84
969.0	B	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-8	51/L02-3/30/84
969.0	D	2.500	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-8	51/L02-3/30/84
1297.6	A	2.490	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-9	51/L02-3/30/84
1297.6	B	2.500	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-9	51/L02-3/30/84
1326.3		2.530	water pycnometer	ambient	ambient	44.672 g	C-10	51/L03-9/7/82
1359.0		2.530	water pycnometer	ambient	ambient	44.813 g	C-10	51/L03-9/7/82
1361.3	A	2.490	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-11	51/L02-3/30/84
1361.3	C	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-11	51/L02-3/30/84
1361.3	D	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-12	51/L02-3/30/84
1361.3	E	2.230	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-12	51/L02-3/30/84
1379.1	A	2.520	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-13	51/L02-3/30/84
1379.1	C	2.500	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-13	51/L02-3/30/84
1379.1	D	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-14	51/L02-3/30/84
1379.1	E	2.530	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-14	51/L02-3/30/84
1380.4	24	2.602	water pycnometer	ambient	ambient	26.398 g	C-15	51/L03-1/10/85
1382.6	25	2.594	water pycnometer	ambient	ambient	29.897 g	C-15	51/L03-1/10/85
1387.0	B	2.530	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-16	51/L02-3/30/84
1387.0	D	2.510	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-16	51/L02-3/30/84
1400.0	26	2.528	water pycnometer	ambient	ambient	29.131 g	C-17	51/L03-1/10/85
1400.7	27A	2.552	water pycnometer	ambient	ambient	26.809 g	C-17	51/L03-1/10/85
1400.7	27B	2.542	water pycnometer	ambient	ambient	27.154 g	C-18	51/L03-1/10/85
1413.0	28	2.587	water pycnometer	ambient	ambient	27.204 g	C-18	51/L03-1/10/85
1424.1	29	2.515	water pycnometer	ambient	ambient	28.031 g	C-19	51/L03-1/10/85
1428.5	30	2.627	water pycnometer	ambient	ambient	28.514 g	C-19	51/L03-1/10/85
1659.2	A	2.560	GD = DBD/(1 + DBD - SBD)	ambient	ambient		C-20	51/L02-3/30/84

NOTE: Sample Length and Sample Diameter not given for USW

EXAMPLE OF SEPDB PRODUCT (DATA REPORT)

BLANK WORK REQUEST FORM

WORK REQUEST

TMP 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
GENISES STAFF

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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: 17, 18, 22, 36, and 67. 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 (January - March 1992) 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 are 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.

12 Perchetti, A.J., 1988. "Lode Mining Claim Map", 1:6,000 scale drawing showing Yucca # 11 - 27 Unpatented Lode Mining Claims.

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.

15 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 transportation features at a 1:100,000 scale.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

16 U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", Transportation. 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.

17* Chornack, M. 1992. Update to location of VSP-1. Verbal communication.

17* Candelarea, W. 1992. Coordinates and elevations for newly drilled neutron-access holes USW UZ-N11, N15, N16, N17, N27, N36, N37, N54, N55, N64. Verbal and written communication.

17 Barton, C.C. 1992. Location of bedrock pavements for the study of fractures. Written communication.

17 Candelarea, W. 1991. Location correction for Trenches 14(E), 14(W), A-1(E), A-1(W), A-2(E), and A-2(W). Personal communication.

17 Reheis, M.S. 1986. Preliminary Study of Quaternary Faulting on the East Side of Bare Mountain, Nye County, Nevada. U.S. Geological Survey Open-File Report 86-576, 14p.

17 Swadley, W.C. and D.L. Hoover. 1983. Geology of Faults Exposed in Trenches in Crater Flat, Nye County, Nevada. U.S. Geological Survey Open-File Report 83-608, 15p.

17 Swadley, W.C., D.L. Hoover and J.N. Rosholt. 1984. Preliminary Report on Late Cenozoic Faulting and Stratigraphy in the Vicinity of Yucca Mountain, Nye County, Nevada. U.S. Geological Survey Open-File Report 84-788, 42p.

17 Swadley, W.C., H.E. Huckins, and E.M. Taylor. 1986. Logs of the Trenches across the Beatty Scarp, Nye County, Nevada. Geological Survey Miscellaneous Filed Studies Map MF-1987.

17 Taylor, E.M. 1986. Impact of Time and Climate on Quaternary Soils in the Yucca Mountain Area of the Nevada Test Site. M.S. Thesis, University of Colorado.

17 Yount, J.C. 1987. Trench Logs from a Strand of the Rock Valley Fault System, Nevada Test Site, Nye County, Nevada. U.S. Geological Survey Miscellaneous Filed Studies Map MF-1824.

17 Yount J.C. 1992. Locations of trenches at Frenchman Flat and Crater Flat South. Written communication.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

17	U.S. Department of Energy, 1986. "NNWSI Drill Hole Map", prepared by Holmes and Narver, Inc.; Drawing Number JS-025-001-C2, Rev. 2; 1:12,000 scale. (Used as a location/identifier cross-check source).
17	U.S. Department of Energy, 1985. "Regional NNWSI Map", prepared by Holmes and Narver, Inc.; Drawing Number JS-025-002-C1; 1:48,000 scale. (Used as a location/identifier cross-check source).
17	U.S. Department of Energy, 1988. "Yucca Mountain Project Site Atlas", YMP/88-21.
17	Fenix and Scisson, 1986. "NNWSI Hole Histories UE-25a #1, UE-25a #3, UE-25a #4, UE-25a #5, UE-25a #6, UE-25a #7", DOE/NV/10322-9.
17	Fenix and Scission, 1986. "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.
17	Fenix and Scisson, 1986. "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.
17	Fenix and Scisson, 1986. "NNWSI Hole Histories UE-29a #1 and UE-29a #2", DOE/NV/10322-12.
17	Fenix and Scisson, 1986. "NNWSI Hole History UE-25b #1", DOE/NV/10322-13
17	Fenix and Scisson, 1986. "NNWSI Hole Histories UE-25c #1, UE-25c #2, UE-25c #3, DOE/NV/10322-14. Fenix and Scisson, 1986. "NNWSI Hole History UE-25-h #1", DOE/NV/10322-15.
17	Fenix and Scisson, 1986. "NNWSI Hole History UE-25p #1", DOE/NV/10322-16
17	Fenix and Scisson, 1986. "NNWSI Hole Histories USW VH-1 and USW VH-2", DOE/NV/10322-17.
17	Fenix and Scisson, 1987. "NNWSI Hole Histories USW H-1, USW H-3, USW H-4, USW H-5, and USW H-6", DOE/NV/10322-18.
17	Fenix and Scisson, 1987. "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.
17	Fenix and Scisson, 1987. NNWSI Hole Histories UWS UZ-1, UE-25 UZ #4, UE-25 UZ #5, USW UZ-6, USW UZ-6s, USW UZ-7, USW UZ-8, USW UZ-13", DOE/NV/10322-20.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

17 Fenix and Scisson, 1987. "NNWSI Hole Histories, Unsaturated Zone - Neutron Holes, 76 Boreholes Drilled Between May 1984 and February 1986", DOE/NV/10322-21.

17 Fenix and Scisson, 1987. "NNWSI Drilling and Mining Summary", DOE/NV/01322-24.

17 Fenix and Scisson, 1987. "NNWSI 51 Seismic Hole Histories", DOE/NV/10322-25.

18* Candelarea, W. 1992. ESF Soil and Rock Properties Study - NRSF Test Pits. Verbal and written communication.

18 Crowe, B. 1991. Location change for proposed volcanic hole USW V-2. Personal communication.

18* Hayes, L. 1991. Revision #1 of JP 91-9. Position Revision to USW UZ N27. Letter 4/21/92.

18* Hayes, L.R. 1991. Preliminary Input for Proposed Test Planning Package for Reflection Profiling. Letter to Russ Dyer, dated November 25, 1991.

18 U.S. Geological Survey. 1991a. Criteria letter for YMP-YMSO Contractors services for drilling, testing, in instrumenting UE-25, VSP-2 (UZ-16) and UE-25 VSP-1 (US-15). YMP-USGS-3343G-01-C3, RO. Written communication from L. Hayes to C. Gertz.

18 U.S. Geological Survey. 1991b. Approximate locations for proposed pits and trenches. Written communication to T. Sullivan.

18 U.S. Department of Energy briefing TGGDW3P, 25 Sep 1991. North and South Ramp Portal Exploration Drill Holes.

18 U.S. Department of Energy, 1985. "Regional NNWSI Map", prepared by Holmes and Narver, Inc.; Drawing Number JS-025-002-C1; 1:48,000 scale. (Used as a location/identifier cross-check source).

18 U.S. Department of Energy, 1988. "Yucca Mountain Project Surface-based Investigations Plan", Volumes 1-4, YMP/88-25.

19 Sandia National Laboratories, 1986. "Conceptual Controlled Area Boundary", IGIS Drawing Number CAL0166.

20 Sandia National Laboratories, 1986. "Nuclear Waste Repository in Tuff, Subsurface Facility Conceptual Design, General Underground Facility Layout, Drainage Configuration and Vertical Emplacement", SNL Drawing Number R07003A.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

21 U.S. Department of Energy, 1991. "Subsurface Access Drifts" prepared by Raytheon Services of Nevada; Drawing Number YMP-025-1-MING-MI01.

22 U.S. Department of Energy, 1987. "ESF Overall Site Plan -Layout No. 8", prepared by Holmes and Narver, Inc.; Drawing Number SK-025-002-C14, 1:2,400 scale drawing. Manually digitized. 23 Rautman, C., 1987. Sandia National Laboratories, IGIS product number CAL0194.

22* U.S. Department of Energy. 1992. YMP Criteria for NTS Contractors' Services - Geotechnical Exploration in Support of Title II Design of the Exploratory Studies Facility, WBS 1.2.3.2.6.2.1. U.S. Bureau of Reclamation Study Plan YMP-USBR-8.3.1.14.2-01-C2, R0.

22* U.S. Department of Energy. 1991. Overall Site Plan - Exploratory Studies Facility, General Arrangement. Raytheon Services Nevada Drawing Number YMP-025-1-CIVL-PL01, Rev. 0.

24 U.S. Geological Survey, 1956 and 1976 1:24,000 scale 7.5' topographic quadrangle and 1986 1:24,000 orthophoto maps:

24 Bare Mountain, NE Bare Mountain, SE Big Dune, NE Topopah Spring, NW Topopah Spring, SW Lathrop Wells,

24 EG&G Energy Measurements, Inc. aerial photography flown at a scale of 1:24,000 in July 1986 and September 1987.

25 Boundaries of geofeatures and their names were interpreted from U.S. Geological Survey 1:250,000 scale maps. Caliente, NV;UT, 1954, Revised 1970 Death Valley, CA;NV, 1954, Revised 1970 Goldfield, NV;CA, 1954, Revised 1970 Kingman, AZ;NV;CA, 1954, Revised 1969 Las Vegas, NV;AZ;CA, 1954, Revised 1969 Trona, CA, 1954, Revised 1970

26 U.S. Geological Survey, 1986. "Greater Exploratory Shaft Area, Yucca Mountain, NV", 1:2,400 scale (2 foot elevation contour interval); produced by USGS Branch of Astrogeology, Flagstaff, Arizona for the U.S. Department of Energy.

27 Digital elevation contours (10 foot intervals) were generated in 1991 for an area covering the Repository Block Area. An index map has been prepared to show the areal extent and sheet boundaries for these contour maps.

28 U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", Hypsography (20 foot elevation contours). Topopah Spring NW, Nevada, 1961. Topopah Spring, Nevada, 1961. 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.

28 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.

29 U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", Hypsography (40 foot elevation contours). Beatty Mountain, Nevada, 1987, Provisional. East of Beatty Mountain, Nevada, 1987, Provisional. Carrara Canyon, Nevada, 1981, Provisional.

30 U.S. Geological Survey, 1985. "Topographic Maps of Yucca Mountain Area, Nye County, Nevada", 1:5,000 scale (two meter elevation contours); produced by USGS Branch of Astrogeology for the U.S. Department of Energy.

31 U.S. Geological Survey 30 x 60 Minute Series Topographic Quadrangle Map, 1986, 1:100,000 Scale Metric, Beatty, Nevada-California; Contour interval 50 meters (manually digitized).

32 U.S. Geological Survey, "1:250,000 Scale Digital Elevation Model (DEM) Data", produced by the Defense Mapping Agency, 1o x 1o blocks:

32 Caliente, NV;UT, 1954, Revised 1970 Death Valley, CA;NV, 1954, Revised 1970 Goldfield, NV;CA, 1954, Revised 1970 Las Vegas, NV;AZ;CA, 1954, Revised 1969

33 U.S. Geological Survey, "1:24,000 Scale 7.5-minute Digital Elevation Model Data", 30 meter UTM spacing. 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. 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.

36 Ackermann, H.D., W.D. Mooney, D.B. Snyder and V.D. Sutton, 1988. "Preliminary Interpretation of Seismic Refraction and Gravity Studies West of Yucca Mountain, Nevada and California", in Carr, M.D. and J.C. Yount (eds), "Short Contributions to the Geology and Hydrology of a Potential Nuclear Waste Site at Yucca Mountain, Southern Nevada", U.S. Geological Survey Bulletin 1790, p. 23-33.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

36 Hoffman, L.R. and W.D. Mooney, 1983. "A Seismic Study of Yucca Mountain and Vicinity, Southern Nevada: Data Report and Preliminary Results", U.S. Geological Survey Open File Report 83-588, 50 pages, 1 plate.

36* Hoffman, L.R. and W.D. Mooney. 1984. A Seismic Study of Yucca Mountain and Vicinity, Southern Nevada; Data Report and Preliminary Results. U.S. Geological Survey Open-File Report 83-588, 50p.

36 Pankratz, L. W., 1982. "Reconnaissance Seismic Refraction Studies at Calico Hills, Wahmonie, and Yucca Mountain: Southwest Nevada Test Site, Nye County, Nevada". USGS-OFR-82-478, Figure 8.

36* Sutton, V. D. 1985. Data Report for the 1985 Seismic-Refraction Experiment at Yucca Mountain and Vicinity, Southwestern Nevada. U.S. Geological Survey Open-File Report 85-591, 96p.

37 McGovern, T.F., 1983. "Evaluation of Seismic Reflection Studies in the Yucca Mountain Area, Nevada Test Site". USGS-OFR-83-912, Figure 1A.

37 Serpa, L., B. de Voogd, L. Wright, J. Willemin, J. Oliver, E. Hauser, and B. Troxel, 1988. "Structure of the Central Death Valley Pull-Apart Basin from COCORP Profiles in the Southern Great Basin", Geological Survey of America Bulletin, V. 100, P. 1437-1450.

38 Hoover, D.B., W.F. Hanna, L.A. Anderson, V.J. Flanigan, and L.W. Pankratz, 1982. "Geophysical Studies of the Syncline Ridge Area Nevada Test Site, Nye County, Nevada", U.S. Geological Survey Open File Report 82-145.

38 Hoover, D.B., M.P. Chornack, K.H. Nervick, and M.M. Broker, 1982. "Electrical Studies at the Proposed Wahmonie and Calico Hills Nuclear Waste Sites, Nevada Test Site, Nye County, Nevada", U.S. Geological Survey Open File Report 82-446.

39 Senterfit, R.M., D.B. Hoover, and M.P. Chornack, 1982. "Resistivity Sounding Investigation by the Schlumberger Method in the Yucca Mountain and Jackass Flats Area, Nevada Test Site, Nevada", U.S. Geological Survey Open File Report 82-1043. Smith, C., and H.P. Ross, 1982. "Interpretation of Resistivity and Induced Polarization Profiles with Sever Topographic Effects, Yucca Mountain Area, Nevada Test Site, Nevada", U.S. Geological Survey Open File Report 82-182.

39 Ross, H.P., and J. Lunbeck, 1978. "Interpretation of Resistivity and Induced Polarization Profiles, Calico Hills and Yucca Mountain Areas, Nevada Test Site", University of Utah Research Institute Report ESL-UURI-8.

39 Frischknecht, F.C. and P.V. Raab, 1984. "Time Domain Electromagnetic Soundings at the Nevada Test Site, Nevada", Geophysics, V. 49, N. 7, July 1984, P. 981-992.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

40 Greenhaus, M.R. and C.J. Zablocki, 1982. "A Schlumberger Resistivity Survey of the Amargosa Desert, Southern Nevada", U.S. Geological Survey Open File Report 82-897.

41 Scott, R.B., and J. Bonk, 1984. "Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada With Geologic Cross Sections". USGS-OFR-84-494, 1:12,000 scale.

41 Christiansen, R.L. and P.W. Lipman, 1965. "Geologic Map of the Topopah Spring NW Quadrangle, Nye County, Nevada", U.S. Geological Survey Geologic Quadrangle Map GQ-444, Scale 1:24,000. Not all faults are digitized for this map.

41 Lipman, P.W. and E.J. McKay, 1965. "Geologic Map of the Topopah Spring SW Quadrangle, Nye County, Nevada". U.S. Geological Survey Geologic Quadrangle Map GQ-439, Scale 1:24,000. Not all faults are digitized for this map.

42 Scott, R.B., and J. Bonk, 1984. "Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada With Geologic Cross Sections". USGS-OFR-84-494, 1:12,000 scale.

43 Scott, R.B., and J. Bonk, 1984. "Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada With Geologic Cross Sections". USGS-OFR-84-494, 1:12,000 scale.

44 Scott, R.B., and J. Bonk, 1984. "Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada With Geologic Cross Sections". USGS-OFR-84-494, 1:12,000 scale.

45 Scott, R.B., and J. Bonk, 1984. "Preliminary Geologic Map of Yucca Mountain, Nye County, Nevada With Geologic Cross Sections". USGS-OFR-84-494, 1:12,000 scale.

46 U.S. Geological Survey, 1970. "National Atlas of the United States of America", Digital Line Graphs at 1:2,000,000 scale. 47 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 hydrographic features at a 1:100,000 scale.

48 U.S. Geological Survey, National Mapping Program. "Digital Line Graphs from 1:24,000 Scale Maps", Hydrography. 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.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

49 United States Geological Survey, 1983. "Map Showing Approximate Flood Prone Areas, Fortymile Wash And Its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada". From Water Resources Investigation Report 83-4001 (Plate 1); Hydrology mapped by R.R. Squires and R.L. Young, 1982.

50 United States Geological Survey, 1983. "Map Showing Approximate Flood Prone Areas, Fortymile Wash And Its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada". From Water Resources Investigation Report 83-4001 (Plate 1); Hydrology mapped by R.R. Squires and R.L. Young, 1982.

51 United States Geological Survey, 1983. "Map Showing Approximate Flood Prone Areas, Fortymile Wash And Its Principal Southwestern Tributaries, Nevada Test Site, Southern Nevada". From Water Resources Investigation Report 83-4001 (Plate 1); Hydrology mapped by R.R. Squires and R.L. Young, 1982.

52 Division of Water Resources, State Engineers Office, 1971. Compiled by F.E. Rush, B.R. Scott, A.S. Van Denburgh and B.J. Vasey. "State of Nevada Water Resources and Inter-Basin Flows". An area covering from 117° 00′ 00"W 36° 00′ 00"N to 115° 00′ 00"W 38° 00′ 00"N was manually digitized.

53 Cochran, G. 1992. Location of precipitation monitoring sites. Personal communication.

53 Kane, T.G. In review (provisional). Streamflow and Selected Precipitation Data for Yucca Mountain and Vicinity, Nye County, Nevada - Water Years 1983-1985. U.S. Geological Survey.

53 U.S. Geological Survey, "Modifications to requested neutron hole locations" 7 Feb 1992.

53 Girdley, W.A. 1991. "Coordinates for additional neutron-access boreholes."

53 U.S. Department of Energy. 1991. Monitoring Program for Ground-water Levels and Springflows in the Yucca Mountain Region of Southern Nevada and California. U.S. Geological Survey Quarterly Report Draft, 20p.

53 Proposed water-level monitoring and spring-discharge monitoring site locations were derived from coordinate data as reported by Walker and Eakin, 1963; Thordarson, 1967; Johnston, 1968; and Dudley and Larson, 1976.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

54 Waddell, R.K., J.H. Robison, and R.K. Blankennagel, 1984. "Hydrology of Yucca Mountain and Vicinity, Nevada-California, Investigation Results Through Mid-1983". U.S. Geological Survey Water Resources Division Report 84-4267, Plate 3 "Potentiometric Map of Candidate Area and Geologic Section, Nevada-California".

55 EG&G Energy Measurements, Inc., Environmental Sciences Department, 1989. "Tortoise Sign Location Map", EG&G/EM-NTS-EES-MAP-360.

56 Collins, E., and T.P. O'Farrell, 1985. "1984 Biotic Studies of Yucca Mountain, Nevada Test Site, Nye County, Nevada". U.S. Department of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. 1183-2057.

56 O'Farrell, T.P. and E. Collins, 1984. "1983 Biotic Studies of Yucca Mountain, Nevada Test Site, Nye County, Nevada". U.S. Department of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. 10282-2031.

56 O'Farrell, T.P. and E. Collins, 1983. "1982 Biotic Survey of Yucca Mountain, Nevada Test Site, Nye County, Nevada". U.S. Department of Energy Topical Report, EG&G/EM Santa Barbara Operations Report No. 10282-2004.

56 EG&G Energy Measurements, Inc., Environmental Sciences Department, 1989. "Tortoise Sign Location Map", EG&G/EM-NTS-EES-MAP-360.

57 Science Applications International Corporation, 1988. Small mammal trapline sampling locations were provided by J.K Prince. Locations were drafted onto a full scale (1:12,000 scale) copy of the Scott and Bonk, 1984 preliminary geologic map of Yucca Mountain.

58 EG&G Energy Measurements, Inc, Environmental Studies Department, 1989. "Proposed Lagomorph Transect Cluster A & B Locations for Yucca Mountain Project", drafted onto USGS 1:24,000 scale 7.5' topographic quadrangle, Busted Butte, Nev.

58 EG&G Energy Measurements, Inc, Environmental Studies Department, 1989. "Proposed Lagomorph Transect Cluster C Locations for Yucca Mountain Project", drafted onto USGS 1:24,000 scale 7.5' topographic quadrangle, Crater Flat, Nev.

59 EG&G Energy Measurements, Inc., Environmental Studies Department, 1989. "Proposed Scent-Station Routes A & B and Location for Yucca Mountain Project", drafted onto USGS 1:24,000 scale 7.5' topographic quadrangle, Busted Butte, Nev.

59 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.

60 U.S. Department of Energy. 1991. Yucca Mountain Site Characterization Project Environmental Field Activity Plan for Terrestrial Ecosystems. Draft Report No. YMP/91-41.

61 Szabo, B.J., W.J. Carr, and W.C. Gottschall. 1981. Uranium Thorium Dating of Quaternary Carbonate Accumulations in the Nevada Test Site Region, Southern Nevada. U.S. Geological Survey Open-File Report 81-119. 35p.

61 Szabo, B.J. and P.A. O'Malley. 1985. Uranium-Series Dating of Secondary Carbonate and Silicon Precipitates Relating to Fault Movements in the Nevada Test Site Region and of Caliche and Travertine Samples from the Amargosa Desert. U.S. Geological Survey Open-File Report No. 85-47. 12p.

62 Spaulding, W.G. 1983. Vegetation and Climates of the Last 45,000 Years in the Vicinity of the Nevada Test Site, South-Central Nevada. U.S. Geological Survey Open-File Report 83-535. 199p.

63 Spaulding, W.G. 1983. Vegetation and Climates of the Last 45,000 Years in the Vicinity of the Nevada Test Site, South-Central Nevada. U.S. Geological Survey Open-File Report 83-535. 199p.

64 Raker, S.L. and R.L. Jacobson. 1987. Chemistry of Groundwater in Tuffaceous Rocks, Central Nevada. Desert Research Institute, Water Resources Center Report No. NWPO-TR-006-87. 111p.

65 Ingraham, H.L., B.F. Lyles, R.L. Jacobson, and J.W. Hess. 1991. Stable Isotopic Study of Precipitation and Spring Discharge in Southern Nevada. Journal of Hydrology, Volume 125, pp. 243-258.

65 Russell, C. 1992 Locations of water monitoring sites and precipitation gauges. Personal communication.

65 Henne, M.S. 1982. The Dissolution of Rainier Mesa Volcanic Tuffs and its Application to the Analyses of the Groundwater Environment. Unpublished MS thesis, University of Nevada, Reno.

65 Russell, C. Hydrological Investigations of Flow in Fractured Tuff, Rainier Mesa, Nevada Test Site. Desert Research Institute, Water Resources Center Report No. 40572.

65 Hess, J. Research Files Dealing with Soil Moisture Collection holes on Rainier Mesa, Desert Research Institute, Water Resources Center.

TABLE 2-2 REFERENCE AND SOURCE CITATIONS FOR GENISES DATA

66 Ramirez, A.L. and W.D. Daily. 1984. Preliminary Evaluation of Alterant Geophysical Tomography in Welded Tuff. Lawrence Livermore National Laboratory Report UCID-20289, 39p.

66 Ramirez, A.L. and W.D. Daily. 1984. Preliminary Evaluation of Alterant Geophysical Tomography in Welded Tuff. Lawrence Livermore National Laboratory Report UCRL-92229, 9p.

66 Zimmerman, R.M. and R.E. Finley. 1987. Summary of Geomechanical Measurements in and around the G-Tunnel Underground Facility. Nevada Test Site, Sandia National Laboratory Report SAND86-1015. 159p.

67 Czarnecki, J.B. 1987. Research Files Dealing with the Regional Groundwater Flow System Investigations. U.S. Geological Survey unpublished data.

67* McKinley, P.W., M.P. Long, and L. V. Benson. 1991. Chemical Analyses of Water from Selected Wells and Springs in the Yucca Mountain Area, Nevada and Southeastern California. U.S. Geological Survey Open-File Report 90-355, 47p.

68 Lee, J. Computer data files dealing with seismic monitoring data associated with weapons testing at the NTS, Sandia National Laboratory, unpublished data Seismic Monitoring Network

69 Rogers, A.M., S.C. Harmsen, W.J. Carr, and W. Spence. 1983. Southern Great Basin Seismological Data Report for 1981 and Preliminary Data Analysis. U.S. Geological Survey Open-File Report 83-669. 240p.

70 Hoffman, L.R. and W.D. Mooney. 1983. A seismic Study of Yucca Mountain and Vicinity, Southern Nevada: Data Report and Preliminary Results. U.S. Geological Survey Open-File Report 83-588. 1 plate, 50p.

70 Sutton, V.D. 1985. Data Report for the 1985 Seismic Refraction Experiment at Yucca Mountain and Vicinity, Southwestern Nevada. U.S. Geological Survey Open-File Report 85-591, 17 plates, 96p.

71 Bath, G.D. and C.E. Jahren. 1985. Investigations of an Aeromagnetic Anomaly on West Side of Yucca Mountain, Nye County, Nevada. U.S. Geological Survey Open-File Report 85-459, 24 p.

72 Bath, G.D. and C.E. Jahren. 1984. Interpretations of Magnetic Anomalies at a Potential Repository Site Located in Yucca Mountain area, Nevada Test Site. U.S. Geological Survey Open-File Report 84-120. 40p.

73 Snyder, D.B. and W.J. Carr. 1982. Preliminary Results of Gravity Investigations at Yucca Mountain and Vicinity, Southern Nye County, Nevada. U.S. Geological Survey Open-File Report 820701, 36p.

73 Harris, R.N., D.A. Ponce, D.L. Healey, and H.W. Oliver. 1989. Principal Facts for About 16,000 Gravity Stations in the Nevada Test Site and Vicinity. U.S. Geological Survey Open-File Reports 89-682A, 89-682B, 89-682C.

74 Fitterman, D.V. 1982. Magnetometric Resistivity Survey Near Fortymile Wash, Nevada Test Site, Nevada. U.S. Geological Survey Open-File Report 82-401, 27p.

75 Glanzman, V.M. 1991. Bibliography of Publications Related to the Yucca Mountain Site Characterization Project Prepared by U.S. Geological Survey Personnel Through April 1991. U.S. Geological Survey Open-File Report 91-341. 52p.

76 Mueller, J. 1991. EG&G/EM Santa Barbara Operations Yucca Mountain Biological Resources Monitoring Program Annual Report, FY91. p. 45-48.

77 Fergerson, R.B. 1982 Remote-Reference Magnetotelluric Survey, Nevada Test Site and Vicinity, Nevada and California. U.S. Geological Survey Open-File Report 82-465.

3.0 SIGNIFICANT ACTIVITIES THIS QUARTER

3.1 Data Added During 4/01/92 - 6/30/92:

PARTICIPANT	CITATION	TITLE
USGS	17	Update to Location of VSP-1
RSN	17	Update to Neutron-Access Holes
USGS	18	Borehole Location Revision, JP91-9, Update to USW UZ N27
USGS	18	Update to NRSF Test Pits
USGS	18	Update of Proposed Reflection Profiling
DOE	22	Modification of Exploratory Studies Facility
USGS	36	Update to Seismic Refraction Survey Locations
USGS	67	New Spring and Wells Locations

3.2 Requested and Delivered Products (4/01/92 - 6/30/92)

PRODUCT NUMBER	TITLE	REQUESTOR
YMP-92-057.0	Calcite Silica Drillholes	St. Clair/M&O
YMP-92-058.0	Fortymile Wash Recharge Area	St. Clair/M&O
YMP-92-059.0	Design Support Holes	St. Clair/M&O
YMP-92-065.0	Systematic Drilling Holes	St. Clair/M&O
YMP-92-066.0	Unsaturated Zone Holes	St. Clair/M&O
YMP-92-067.0	Geological Holes	St. Clair/M&O
YMP-92-068.0	In Situ Stress Drilling	St. Clair/M&O
YMP-92-069.0	Drillholes for Water Supply and Tests	St. Clair/M&O
YMP-92-070.0	Near-field Drillholes	St. Clair/M&O
YMP-91-025.1	Existing Drillholes and Subsurface Access Ramps	Braun/SAIC
YMP-92-073.0	YMP Tortise Signposts Designating Limited Access	Pysto/SAIC Simms/SAIC

YMP-92-074.0	Field Planning Map for Selected Planned Activities	Girdley/YMPO
YMP-92-075.0	Field Planning Map for Selected Planned Activities	Girdley/YMPO
YMP-92-076.0	Field Planning Map for Planned Neutron-Access Boreholes, FY92	Girdley/YMPO
YMP-92-077.0	Field Planning Map for Planned Artificial Infiltration Plots, FY93	Girdley/YMPO
YMP-92-078.0	Field Planning Map for Planned Neutron Access Boreholes, FY93	Girdley/YMPO
YMP-92-072.0	YMP Field Planning Maps	Rautenstrauch/EG&G
YMP-92-056.0	YMP Potential Hazards Map	Ryder/YMPO
YMP-92-045.0	Selected Existing Drillholes in N. Crater Flat	Spengler/USGS
YMP-92-046.0	Selected Existing Drillholes in S. Crater Flat	Spengler/USGS
YMP-92-047.0	Selected Existing Drillholes in N. Busted Butte	Spengler/USGS
YMP-92-048.0	Selected Existing Drillholes in S. Busted Butte	Spengler/USGS
YMP-92-049.0	Selected Existing Drillholes in Topopah Spring	Spengler/USGS
YMP-92-073.1	YMP Tortoise Signposts	Simms/SAIC
YMP-92-026.1	Proposed Drillholes and Subsurface Access Ramps	Weeks/SAIC
YMP-92-034.0	Natural Infiltration Holes	Weeks/SAIC
YMP-92-013.0	Yucca Mountain Site Characterization Project	Handy/USGS
YMP-92-015.0	Volcanic Vent Locations & Volcanic Flows	Handy/USGS
YMP-92-016.0	Northern Extent of Tortoises	Handy/USGS
YMP-92-021.0	YMP Field Planning Map, Busted Butte & Jackass Flats USGS 7 1/2' Quadrangles	Handy/USGS

YMP-92-022.0	Revised Flood-prone Map Without Drillholes	Handy/USGS
YMP-92-022.1	Revised Floor-prone Map With Drillholes	Handy/USGS
YMP-92-022.2	Revised Floor-prone map With Drillholes	Handy/USGS
YMP-92-023.0	YMP Ground Control Points	Handy/USGS
YMP-92-025.0	YMP Area Designator Map	Handy/USGS
YMP-92-026.0	Local Area Map	Handy/USGS
YMP-92-027.0	Air Quality & Meteorology Monitoring Sites	Handy/USGS
YMP-92-028.0	Regional Area Map	Handy/USGS
YMP-92-030.0	YMP Field Planning Map	Handy/USGS
YMP-92-031.0	Calcite Silica Drillholes	Handy/USGS
YMP-92-032.0	Fortymile Wash Recharge Study	Handy/USGS
YMP-92-033.0	Solitario Canyon Fault Study	Handy/USGS
YMP-92-034.0	Natural Infiltration	Handy/USGS
YMP-92-035.0	Design Support Holes	Handy/USGS
YMP-92-036.0	Systematic Drilling Holes	Handy/USGS
YMP-92-037.0	Unsaturated Zone Drillholes	Handy/USGS
YMP-92-038.0	Volcanic Drilling	Handy/USGS
YMP-92-039.0	Water Tables Holes	Handy/USGS
YMP-92-040.0	Drillholes for Water Supply and Tests	Handy/USGS
YMP-92-041.0	Geologic Holes	Handy/USGS
YMP-92-042.0	Southern Tracer Complex	Handy/USGS
YMP-92-043.0	In Situ Stress Drilling	Handy/USGS
YMP-92-044.0	Artificial Infiltration	Handy/USGS
YMP-92-059.0	Design Support Holes	St. Clair/M&O

YMP-92-066.0	Unsaturated Zone	St. Clair/M&O
YMP-92-071.0	YMP Field Map for Radiation Field Programs	Tappen/SAIC
YMP-92-083.0	YMP Drillhole Summary	Weeks/SAIC
YMP-91-025.1	Existing Drillholes and Subsurface Access Drifts	Datta/M&O
YMP-92-073.1	YMP Tortoise Signposts Designating Limited Access	Simms/SAIC
YMP-91-001.3	YMP Flood Prone Areas	Borg/SAIC
YMP-92-082.0	YMP Location of Proposed Drillholes NRG-6 and UZ-14	Schlinger/SAIC
YMP-91-009.1	YMP Meteorological Monitoring Sites	Powers/SAIC
YMP-92-003.2	YMP Regional Water Level and Spring Discharge Monitoring Sites	Powers/SAIC
YMP-92-026.1	Proposed Drillholes and Subsurface Access Drifts	White/YMPO
YMP-92-003.3	Regional Water Level and Spring Discharge Monitoring Sites	Fasano/SAIC
YMP-92-085.0	YMP Field Planning Map	Braun/SAIC
YMP-92-045.0	Selected Existing Drillholes in N. Crater Flat	Spengler/USGS
YMP-92-046.0	Selected Existing Drillholes in S. Crater Flat	Spengler/USGS
YMP-92-047.0	Selected Existing Drillholes in N. Busted Butte	Spengler/USGS
YMP-92-048.0	Selected Existing Drillholes in S. Busted Butte	Spengler/USGS
YMP-92-049.0	Selected Existing Drillholes in Topopah Spring	Spengler/USGS
YMP-92-086.0	Radiological/Environmental Field Program Monitoring Stations	Blomquist/EG&G
YMP-92-087.0	Radiological/Environmental Field Program Monitoring Stations	Blomquist/EG&G

YMP-91-022.1	Existing Drillholes	Goewert/M&O
YMP-92-088.0	2500 Ft Buffers Around Proposed Leach Fields	Goewert/M&O
YMP-92-090.1	Selected Proposed Drillholes	Barry/SAIC
YMP-92-089.1	Flood Prone Area	Olsson/SAIC
YMP-92-092.0	Existing Drillholes & Trenches with One Mile Buffer around NRG-1	Pysto/SAIC
YMP-92-095.1	Environmental Sampling Locations, Reclamation Trial Sites & Existing Activities	Ostler/EG&G
YMP-92-096.1	YMP Reclamation Trial Sites	Ostler/EG&G
YMP-92-088.0	One-Half Mile Buffer Around ESF Leach Fields	Goewert/M&O
YMP-92-099.0	Environmental Planning Field Map	Goodwin/EG&G
YMP-91-074.1	Tortoise Treatment Codes	Blomquist/EG&G
YMP-92-009.0	Yucca Mountain Project	Blomquist/EG&G
YMP-91-082.1	Ecological Studies	Blomquist/EG&G
YMP-92-016.0	Northern Extension of Desert Tortoise	Blomquist/EG&G
YMP-92-100.0	Environmental Sampling Locations	Blomquist/EG&G
YMP-92-102.0	Environmental Planning Map	Girdley/YMPO
YMP-92-101.0	YM Area Base Map	Blomquist/EG&G
YMP-92-097.0	EEI Tour Map	Newbury/YMPO
SA1-2.0	Southern Nevada Regional Map	Newbury/YMP
YMP-92-098.0	EEI Tour Map	Nebury/YMPO
YMP-92-056.0	YMP Potential Hazards map	Handy/USGS
YMP-92-057.0	Calcite Silica Drillholes	Handy/USGS
YMP-92-058.0	Fortymile Wash Recharge Study	Handy/USGS
YMP-92-059.0	Design Support Holes	Handy/USGS
YMP-92-065.0	Systematic Drilling Holes	Handy/USGS

YMP-92-066.0	Unsaturated Zone Holes	Handy/USGS
YMP-91-067.0	Geologic Holes	Handy/USGS
YMP-92-068.0	In Situ Stress Drilling	Handy/USGS
YMP-92-069.0	Drillholes for Water Supply & Tests	Handy/USGS
YMP-92-070.0	Near-Field Drillholes	Handy/USGS
YMP-92-071.0	YMP Field Map for Radiation Field Programs	Handy/USGS
YMP-92-072.0	YMP Field Planning Map	Handy/USGS
YMP-92-073.0	YMP Tortoise Signposts Designating Limited Access	Handy/USGS
YMP-92-073.1	YMP Tortoise Signposts	Handy/USGS
YMP-92-074.0	Field Planning Map for Selected Planned Activities	Handy/USGS
YMP-92-075.0	Field Planning Map for Selected Planned Activities	Handy/USGS
YMP-92-076.0	Field Planning Map for Planned Neutron-Access Boreholes, FY92	Handy/USGS
YMP-92-077.0	Field Planning Map for Planned Artificial Infiltration Plots, FY93	Handy/USGS
YMP-92-078.0	Field Planning Map for Planned Neutron Access Boreholes, FY93	Handy/USGS
YMP-92-082.0	YMP Location of Proposed Drillholes NRG-6 and UZ-14	Handy/USGS
YMP-92-083.0	YMP Drillhole Summary	Handy/USGS
YMP-92-097.0	EEI Tour Map	Newbury/YMPO
YMP-92-098.0	EEI Tour Map	Newbury/YMPO
SA1-2	Southern Nevada	Nebury/YMPO
YMP-92-106.0	Biologic Survey Map	Wills/EG&G
YMP-92-105.0	YM Area Base Map	Blomquist/EG&G

YMP-92-103.0	Movements of Relocated Tortoise 423 - March 31, 1992 - May 13, 1992	Rautenstrauch/EG&G
YMP-92-044.0	Artificial Infiltration	Fabryka-Martin/LANL
NTS-91-020.2	Priorities for Automation	Gutentag/USGS
SA4-2.0	Major Vegetation Associations w/Legends	Gutentag/USGS
SA6-1.0	Structural Features & Bedrock/ Alluvium Contacts	Gutentag/USGS
SA6-1.0	Structural Features & Bedrock/ Alluvium Contact w/Legend	Anderson/SAIC
YMP-92-109.0	Reptile Study Plots	Cox/EG&G
YMP-90-056.1	1:6,000 Scale Orthophoto Sheet Index	Hattler/SAIC
YMP-91-005.1	Roads Approved for use based on Completed Desert Tortoise Surveys	Hattler/SAIC
YMP-91-042.1	Subsurface Facility Conceptual Design Drillhole Interference	Hattler/SAIC
YMP-91-043.1	Subsurface Facility Coneptual Design Drillhole Interference	Hattler/SAIC
YMP-91-044.1	Regional Area Map	Hattler/SAIC
YMP-91-056.1	Surface-Based Investigations Plan Water Table Boreholes	Hattler/SAIC
YMP-91-062.1	Location of Proposed Volcanic Exploratory Drillholes	Hattler/SAIC
YMP-91-067.1	Base of the Caprock of the Tiva Canyon Tuff (North)	Hattler/SAIC
YMP-91-072.1	Base of the Caprock of the Tiva Canyon Tuff (South)	Hattler/SAIC
YMP-92-021.0	Field Planning Map Busted Butte and Jackass Flats	Hattler/SAIC
YMP-92-048.0	Selected Existing Drillholes in the Busted Butte Area	Hattler/SAIC
YMP-92-056.0	Potential Hazards Map	Hattler/SAIC

YMP-92-089.1	Flood Prone Areas	Hattler/SAIC
YMP-92-111.0	Native American Site Visit Location Map	Fasano/SAIC
YMP-92-107.0	YMSCP Planning Map	Girdley/YMPO
YMP-91-043.1	Subsurface Facility Conceptual Design Drillhole Interference	Harrison-Giesler/ YMPO
YMP-92-056.0	Potential Hazards Map	Ryder/YMPO
YMP-92-110.0	Feasibility Study for Seismic Reflection Line AV-1	Tynan/YMPO
YMP-92-118.0	Feasibility Study for Seismic Reflection Line AV-1	Tynan/YMPO
YMP-92-119.0	Feasibility Study for Seismic Reflection Line AV-1	Tynan/YMPO
YMP-92-093.0	YMSCP Existing Drillholes	Boak/SAIC
YMP-92-094.0	YMSCP Proposed Drillholes	Boak/SAIC
YMP-91-025.1	YMP Existing Drillholes & Subsurface Access Drifts	Houston/M&O
YMP-91-026.1	YMP Proposed Drillholes & Subsurface Access Drifts	Houston/M&O
YMP-92-093.0	YMSCP Existing Drillholes	Houston/M&O
YMP-92-094.0	YMSCP Proposed Drillholes	Houston/M&O
YMP-92-113.0	Proposed Drillhole Summary	Fabryka-Martin/ LANL
YMP-91-008.2	Orthophoto Sheet Index	Ennis/RSN
YMP-92-094.1	Proposed Drillholes	McNeish/M&O
YMP-92-120.0	YMSCP EG&G/SBO Field Planning Map	Blomquist/EG&G
YMP-92-093.1	Existing Drillholes	Linden/SAIC
YMP-92-093.1	Existing Drillholes	Linden/SAIC
YMP-92-121.0	Midway Valley Pits and Trenches	Hall/LANL
YMP-92-093.1	Existing Drillholes	Lewis/SAIC

YMP-92-047.0	Selected Existing Drillholes in the Busted Butte Area, North Half	Lorenz/YMPO
YMP-92-048.0	Selected Existing Drillholes in the Busted Butte Area, South Half	Lorenz/YMPO
YMP-92-050.0	Selected Existing Drillholes in the Topopah Springs Area	Lorenz/YMPO
YMP-92-022.0	Flood Prone Areas	Gardiner/SAIC
YMP-92-112.0	Radiologic, Biologic, and Hydrologic Monitoring Stations and Other Existing Activities	Tynan/YMPO
YMP-92-114.0	Radiological Monitoring Stations and Other Existing Activities	Tynan/YMPO
YMP-92-115.0	Biological Monitoring Stations and Other Existing Activities	Tynan/YMPO
YMP-92-116.0	Hydrologic Monitoring Stations and Other Existing Activities	Tynan/YMPO
YMP-92-117.0	Seismic Monitoring Stations and Other Existing Activities	Tynan/YMPO
YMP-92-093.1	Existing Drillholes	Bodnar/TRW
YMP-92-094.2	Proposed Drillholes	Bodnar/TRW
YMP-92-123.0	Preactivity Survey Field Map	Wills/EG&G
YMP-92-122.0	Existing Drillholes & Geologic Structure	Datta/TRW
YMP-92-093.1	Existing Drillholes	Schlinger/SAIC
YMP-92-094.2	Proposed Drillholes	Schlinger/SAIC
YMP-92-108.0	NNWSI Drillholes	Schlinger/SAIC
YMP-92-108.0	NNWSI Drillholes	Linden/SAIC
YMP-92-093.1	Existing Drillholes	Bodnar/M&O
YMP-92-094.2	Proposed Drillholes	Bodnar/M&O
YMP-92-093.1	Existing Drillholes	Ryder/YMPO
YMP-92-094.2	Proposed Drillholes	Ryder/YMPO
YMP-92-127.0	Location of UE-25 SRG-1	Nance/SAIC

YMP-92-093.1	Existing Drillholes	Thompson/SAIC
YMP-92-094.2	Proposed Drillholes	Thompson/SAIC
YMP-92-093.1	Existing Drillholes	Hattler/SAIC
YMP-92-094.2	Proposed Drillholes	Hattler/SAIC
YMP-92-128.0	New Activities	Cooper/YMPO
YMP-92-129.0	New Activities	Cooper/YMPO
YMP-92-131.0	Existing Activities	Gertz/YMPO
YMP-92-132.0	Proposed Activities	Gertz/YMPO
YMP-92-126.0	Proposed Groundwater Sampling Sites	Simmons/YMPO
YMP-92-125.0	Potential Hazards Map	Tappen/SAIC
YMP-92-093.1	Existing Drillholes	Pysto/SAIC
YMP-92-094.2	Proposed Drillholes	Pysto/SAIC
YMP-92-125.0	Potential Hazards Map	Adkins/SAIC
YMP-92-093.1	Existing Drillholes	Blanchard/YMPO
YMP-92-094.2	Proposed Drillholes	Blanchard/YMPO
YMP-92-139.0	NTS Ranch Area	White/YMPO
YMP-92-130.0	Proposed 1992 Seismic Reflection Profiles Northeast Area	Savino/T&MSS
YMP-92-133.0	Proposed 1992 Seismic Reflection Profiles Southeast Area	Savino/T&MSS
YMP-92-134.0	Proposed 1992 Seismic Reflection Profiles Southwest Area	Savino/T&MSS
YMP-92-135.0	Proposed 1992 Seismic Reflection Profiles Northwest Area	Savino/T&MSS
YMP-92-080.0	Existing & Proposed Drillholes within 10 KM of the Site Excluding Drillholes within the Perimeter Drift Boundary	Lefevre/NRC
YMP-92-081.0	Existing & Proposed Drillholes within 10 KM of the Site	Lefevre/NRC

YMP-92-079.0	Existing & Proposed Drillholes in the Perimeter Drift Area	Lefevre/NRC
YMP-92-106.0	Biological Study Working Plot	Blomquist/EG&G
YMP-92-130.0	Proposed 1992 Seismic Reflection Profiles Northeast Area	Tynan/YMPO
YMP-92-133.0	Proposed 1992 Seismic Reflection Profiles Southeast Area	Tynan/YMPO
YMP-92-134.0	Proposed 1992 Seismic Reflection Profiles Southwest Area	Tynan/YMPO
YMP-92-135.0	Proposed 1992 Seismic Reflection Profiles Northwest Area	Tynan/YMPO
YMP-92-108.0	NNWSI Drillholes	Schlinger/SAIC
YMP-92-094.2	Proposed Drillholes	Schlinger/SAIC
YMP-92-093.1	Existing Drillholes	Schlinger/SAIC
YMP-92-025.0	Area Designator Map	Schlinger/SAIC
YMP-91-060.0	Environmental Sampling Locations with 200 Meter Buffer and Proposed Activities	Schlinger/SAIC
YMP-92-090.2	Environmental Sampling Locations	Hans/SAIC
YMP-92-148.0	Tracers, Fluids & Materials Area	Kalia/LANL
YMP-92-146.0	Field Planning Map	Rautenstrauch/EG&G
YMP-92-147.0	RFPD Basemap	Tappen/T&MSS
YMP-92-150.0	YMSCP Proposed 1992 Seismic Profile Northeast Area	Tynan/YMPO
YMP-92-151.0	YMSCP Proposed 1992 Seismic Profiles Southeast Area	Tynan/YMPO
YMP-92-152.0	YMSCP Proposed 1992 Seismic Profiles Southwest Area	Tynan/YMPO
YMP-92-153.0	YMSCP Proposed 1992 Seismic Profiles Northwest Area	Tynan/YMPO
YMP-92-143.0	Proposed Drillholes	Bodnar/TRW
YMP-92-144.0	Existing & Proposed Drillholes	Barry/SAIC

YMP-92-145.0	Existing & Proposed Drillholes	Barry/SAIC
YMP-92-085.0	Field Planning Map	McKinley/USGS
YMP-92-086.0	Radiological/Environmental Field Program Monitoring Stations	McKinley/USGS
YMP-92-087.0	Radiological/Environmental Field Program Monitoring Stations	McKinley/USGS
YMP-92-088.0	One-Half Mile Buffer Around ESF Leach Fields	McKinley/USGS
YMP-92-089.1	Flood Prone Areas	McKinley/USGS
YMP-92-089.2	Flood Prone Areas	McKinley/USGS
YMP-92-090.1	Selected Proposed Drillholes	McKinley/USGS
YMP-92-092.0	Existing Drillholes & Trenches with One Mile Buffer Around NRG-1	McKinley/USGS
YMP-92-093.1	Existing Drillholes	McKinley/USGS
YMP-92-094.2	Proposed Drillholes	McKinley/USGS
YMP-92-095.1	Environmental Sampling Locations, Reclamation Trial Sites, & Existing Activities	McKinley/USGS
YMP-92-096.1	Reclamation Trial Sites	McKinley/USGS
YMP-92-097.0	EEI Tour Map	McKinley/USGS
YMP-92-098.0	EEI Tour Map	McKinley/USGS
YMP-92-099.0	Environmental Planning Field Map	McKinley/USGS
YMP-92-100.0	Environmental Sampling Locations	McKinley/USGS
YMP-92-101.0	Area Base Map	McKinley/USGS
YMP-92-102.0	Environmental Planning Map	McKinley/USGS
YMP-92-103.0	Movements of Relocated Tortoise 423 - March 31-may 13, 1992	McKinley/USGS
YMP-92-105.0	Area Base Map	McKinley/USGS
YMP-92-106.0	Biologic Survey Map	McKinley/USGS
YMP-92-107.0	Planning Map	McKinley/USGS

YMP-92-109.0	Reptile Study Plots	McKinley/USGS
YMP-92-110.0	Feasibility Study for Seismic Reflection Line AV-1	McKinley/USGS
YMP-92-111.0	Native American Site Visit Location Map	McKinley/USGS
YMP-92-118.0	Feasibility Study for Seismic Reflection Line AV-1	McKinley/USGS
YMP-92-119.0	Feasibility Study for Seismic Reflection Line AV-1	McKinley/USGS
YMP-92-017.1	Regional Investigations	Newbury/YMPO
YMP-92-157.0	Southern Great Basin Seismic Monitoring Network	Nebury/YMPO
YMP-92-156.0	Regional Investigations with Earthquake Epicenter	Gertz/YMPO

4.0 UPCOMING MAJOR ACTIVITIES

4.1 EG&G/EM RSL YMP SUPPORT OFFICE

The UNIX version of ArcView has been installed at the Support Office and is available for use by Participants. ArcView provides a simple user interface to the GIS database. A PC version of ArcView has been receive and is under evaluation.

A telecommunications link between the Support Office and the rest of the Valley Bank network will be established during the next quarter.

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

Transition of the Site and Engineering Properties Database (SEPDB) was initiated. The transition is expected to be completed by the end of the next quarter.

4.3 Site Atlas Map Portfolio

The YMP Site Atlas was completed and submitted to the Government Printing Office.

THE GEMBOCHS DATABASE AND SOFTWARE LIBRARY

YMP-TDB QUARTERLY REPORT

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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.

<u>Compositional Data for Minerals, Gases, or Aqueous Species</u>

Elemental Composition
Common Name

<u>Reaction Data for Aqueous Dissociation of Minerals, Gases, or Aqueous Species</u>

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

<u>Thermodynamic Data for Minerals</u>

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 DATAO suite for use with EQ3/6 whereas "notused" species are restricted to use within the trial DATAO files used locally. In addition, DBAPP automatically reports all GEMBOCHS updates to a dedicated audit table, which contains the complete modification history of GEMBOCHS.

DOOUT

DOOUT is a FORTRAN77-Equel code that serves as a software pipe between GEMBOCHS and EQPT. DOOUT 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 DATAO 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 DATAO file produced by DOOUT 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 DOOUT 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 DOOUT (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.R10	Composite database	1834
DATA0.sup.R10	SUPCRT91 database	462
DATA0.nea.R10	NEA/CODATA database	424
DATA0.pit.R10	Pitzer database	488
DATA0.hmw.R10	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 "R10" 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: 2nd Qtr., 1992

The subset of the GEMBOCHS audit table that covers the second quarter of 1992 (1 April - 30 June) 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 second quarter of 1992.

<u>DATA0 Suites R13 to R14</u>:

In late April, DBAPP, DOOUT, and EQPT were used to generate the R14 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 R13 and R14. The R14 suites feature the substantially revised set of auxiliary basis aqueous species that have been incorporated into GEMBOCHS and are now available for use in EQ3/6 calculations. This upgrade, which involved modifying the aqueous dissociation reactions and equilibrium-constant grids for over 200 aqueous species, widens significantly the range of geochemical problems that can be addressed using the EQ3/6 modeling package, particularly those problems that involve aqueous organic species.

<u>DATA0 Suites R14 to R15</u>:

In early June, DBAPP, DOOUT, and EQPT were used to generate the R15 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 R14 and $15. The most significant modification incorporated in the R15 suites is the slightly revised equilibrium-constant grid for aqueous dissociation of NaOH(aq).

DATA0 Suites R15 to R16:

In late June, DBAPP, DOOUT, and EQPT were used to generate the R16 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 R15 and R16. In R16 suite, OH- no longer appears as an auxiliary basis species.

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

ABRAHAMS,S.C., BERNSTEIN,J.L., and NASSAU, K., 1976, transition metal iodates. vii. crystallographic and nonlinear optic survey of the 4f-iodates, journal of solid state chemistry, v. 16 , pp. 173-184.

ADAMI,L. and KELLEY,K., 1963, heats of formations of two crystalline hydrates of ferrous sulfate., u.s. bur. mines rept. inv. 6260, p. 7.

AHRLAND,S., 1967, enthalpy and entropy changes by formation of different types of complexes., helv. chim. acta v. 50, pp. 306-318.

AHRLAND,S. and KULLBERG,L. 197 la, thermodynamics of metal complex formation in aqueous solution. i. a potentiometric study of fluoride complexes of hydrogen, uranium(vi), and vanadium(iv), acta chem. scand., v. 25, pp. 3457-3470.

AHRLAND,S. and KULLBERG,L., 1971b, thermodynamics of metal complex formation in aqueous solution. ii. a calorimetric study of flouride complexes of hydrogen, uranium(vi), and vanadium(iv), acta chem. scand., v. 25, pp. 3471-3483.

ALLARD,B., KIPATSI,H. and LILJENZIN,J.O., 1980, expected species of uranium, neptunium and plutonium in neutral aqueous solutions. j. inorg. nucl. chem., v. 42, pp. 1015-1027.

ARNEK,R., 1968, thermochemical studies of hydrolytic reactions., acta chem. scand., v. 4 pp. 1102-1106.

ARNORSSON,S., SIGURDSSON,S. and SVAVARSSON,H. , 1982, the chemistry of geothermal waters in iceland. i. calculation of aqueous speciation from 0 to 370 deg c., geochim. cosmochim. acta, v. 46, pp. 1513-1532.

ARUGA,R., 1975, thermodynamics of ion pairing of nitrate and chlorate with metal Ions in aqueous solution chem. soc. dalton trans., p. 2534-2538.

AZIZ,A. and LYLES,S.J. 1969a, equilibrium constants for aqueous fluoro complexes of scandium, yttrium, americium(iii) and curium(iii) by extraction into di-2-ethylhexyl phosphoric acid., jour. inorg. nucl. chem., v. 31, pp. 3471-3480.

AZIZ,A. and LYLE,S.J. , 1969b, applications of the fluoride-sensitive electrode to the study of metal-fluoride ion association constants., analyt. chim. acta, v. 47, pp. 49-56.

BAES,C.F.,JR. and MESMER,R.E. , 1976, the hydrolysis of cations., wiley-interscience, new york. , 489p.

BAGAWDE,S.V., RAMAKRISHNA,V.V. and PATIL,S.K., 1976a, aqueous tta complexing of np(iv) and pu(lv)., J. inorg. nucl. chem., v. 38, pp. 2085-2089.

BAGAWDE,S.V., RAMAKRISHNA,V.V. and PATIL,S.K. 1976b, complexing of tetravalent plutonium in aqueous solutions., j. inorg. nucl. chem. v. 38, pp. 1339-1345.

BAILEY,A.R. and LARSON,J.W., 1971, heats of dilution and the thermodynamics of dissociation of uranyl and vanadyl sulfates, J. phys. chem., v. 75, pp. 2368-2372.

BALL,J.W., JENNE,E.A. and NORDSTROM,D.K., 1979, wateq2- a computerized chemical model for trace and major element speciation and mineral equilibria of natural waters. in jenne,e.a., ed., chemical modeling in aqueous systems., am. chem. soc. symp. series 93. p. 815-835.

BALL,J.W., NORDSTROM,D.K. and JENNE,E.A., 1980, additional and revised thermochemical data and computer code for wateq2 - a computerized chemical model for trace and major element speciation and mineral equilibria of natural waters., u.s. geol. surv. water resources investigations report, 78-116., 109p

BARANY,R., 1965, heats of formation of goethite, ferrous vanadate, and sanganese molybdate u.s. bur. mines rept. inv. 6618, p. 10

BARANY,R. and ADAMI,L.H., 1965, heats of formation of anhydrous ferric sulfate and indium sulfate., u.s. bur. mines rept. inv. 6687, 8p.

BARIN,I. and KNACKE,O. , 1973, thermochemical properties of inorganic substances., springer-verlag, new york.

BARIN,I., KNACKE,O. and KUBASCHEWSKI,O., 1977, thermochemical properties of inorganic substances. supplement., springer-verlag, new york.

BARNES,H.L. and LANGMUIR,D. , 1981, thermochemical data for substances at 25 c and 1 atm total pressure , unpublished bureau of mines report.

BARTON,P. and BETHKE,P., 1960, thermodynamic properties of some synthetic zinc and copper minerals., amer. jour. sci., v. 258-a, pp. 21-34.

BASKIN,Y. and SMITH,S.D., 1970, enthalpy of formation data in compounds of uranium with va and via elements, j. nuclear mater., v. 37, pp. 209-222.

BASSETT,R.L. , 1977, the geochemistry of boron in thermal waters., stanford university (unpublished dissertation)., 290p.

BASSETT,R.L., 1980, a critical evaluation of the thermodynamic data for boron ions, ion pairs, complexes, and polyanions in aqueous solution at 298.15 k and 1 bar., geochim. et cosmochim. acta, v. 44, pp. 1151-1160.

BATSANOVA,L.R. and LUKINA,L.V., 1972, structure of "hydrated" rare earth element trifuorides, russian journal of inorganic chemistry, v. 17(5), pp. 629-631.

BAUMAN,J.E. 1981, thermodynamic measurements of carbonate equilibria involving metal ions. in gokcen,n.a., mrazek,r.v. and pankratz,l.b. (eds.), techniques for measurement of thermodynamic properties; proceedings of workshop, albany ny, august 1979., u.s. bureau of mines report 8853., p. 268-274.

BEAR,J. and MCTAGGART,H. , 1958, the sulphides, selenides, and tellurides of titanium, zirconium, hafnium, and thorium., aust. j. chem., v. 11, pp. 458-470.

BELYAEV,Y.I., DOBRETSOV,V.N. and USTINOV,V.A., 1979, enthalpy and heat capacity of np2o5 over the temperature range 350-759 k., sov. radiochem. (eng. transl.), v. 21, pp. 386-387.

BENNETT,A.C. and ADAMS,F., 1976, solubility and solubility product of dicalcium phosphate dihydrite in aqueous solutions and soil solutions., soil. sci. soc. amer. jour., v. 40, pp. 39-42.

BERMAN,R.G., 1988, internally-consistent thermodynamic data for minerals in the system na2o-k2o-cao-mgo-feo-fe2o3-al2o3-sio2-tio2-h2o-co2, journal of petrology, v. 29, PP. 445-522.

BIDOGLIO,G., DE PLANO,A. and CHATT,A., 1983, studies on speciation of americium, technecium and neptunium in simulated vitrified-waste leachates, in brookins,g. (ed.), scientific basis for nuclear waste management vi. materials research society symposium proceedings 11/82 boston, mass. materials research society symposium proceedings, north-holland, new york, v. 15 pp. 373-382.

BILINSKI,H. and SCHINDLER,P., 1982, solubility and equilibrium constants of lead in carbonate solutions (25 c, i=0.3 mol dm-3), geochim. cosmochim. acta, v. 46, pp. 921-928.

BILLS,F. and COTTON,F., 1964, the heat of formation of germanium dioxide, j. phys.chem., v. 68, pp. 802-805.

BIRD,D.K. and HELGESON,H.C., 1977, prediction of the chemical characteristics of geothermal reservoir fluids from authigenic mineral assemblages., geol. soc. america abs. with programs, v. 9, pp. 898-899.

BOCHIROL,L., 1951, chaleur specifique vraie des ferrites de zinc, de nickel et de cobalt. compt. rend., v. 232, pp. 1474-1477.

BOND,A.M. and HEFTER,G., 1972, a study of the weak fluoride complexes of the divalent first row transition metal ions with a fluoride ion-selective electrode., j. inorg. nucl. chem., v. 34, pp. 603-607.

BOND,A.M. and TAYLOR,R.J. 1970, polarographic studies of the flouride complexes of tin(ii) in neutral and acidic media. j. electroanal. chem., v. 28, pp. 207-215.

BOULEGUE,J. and MICHARD,G. 1978, constantes de formation des ions polysulfures s6-, s5et s4- en phase aqueuse., jour. fran. hydrologie, v. 9, pp. 27-34.

BOURCIER,W.L. and BARNES,H.L., 1987, ore solution chemistry-vii. stabilities of chloride and bisulfide complexes of zinc to 350 c., econ. geol., v. 82, pp. 1839-1863.

BOURCIER,W.L., KNAUSS,K.G. and JACKSON,K.J. , 1992, aluminum hydrolysis constants to 250° c from boehmite solubility measurements. , to be submitted to geochim. cosmochim. acta.

BOWERS,T.S. and HELGESON,H.C. , 1983, calculation of the thermodynamic and geochemical consequences of nonideal mixing in the system h2o-co2-nacl on phase relations in geologic systems: equation of state for h2o-co2-nacl fluids at high pressures and temperatures geochim. cosmo acta, v. 47, pp. 1247-1275.

BRICKER,O., 1965, some stability relations in the system mn-o2-h2o at 25 deg and one atmosphere total pressure., amer. mineral., v. 50, pp. 1296-1354.

BRODALE,B. and GIAUQUE,W., 1958, low temperature heat capacity and entropy of sodium sulfate decahydrate., am. chem. soc. jour., v. 80, pp. 2042-2044.

BROWN,D., 1968, halides of the transition elements: halides of the lanthanides and actinides, john wiley & sons, great britain, 199p.

BUNCH,T.E. and FUCHS,L.H., 1969, a new mineral: brezinaite cr3s4 and the tucson meteorite., american. mineral., v. 54, pp. 1503-18.

BUSENBERG,E., PLUMMER,L.N. and PARKER,V.B., 1984, the solubility of strontianite (srco3) in co2-h2o solutions between 2 and 91 c, the association constants of srco3+(aq) and srco3(aq) between 5 and 80 c, and an evaluation of the thermodynamic properties of sr++(aq) and srco3(cr) at 25 c and 1 atm total pressure., geochim. cosmochim. acta, v. 48 pp. 2021-2035.

BUSES,R.H., BEVAN,R.B.,JR, GILBERT,R.A., 1972, the heat capacity of potassium pertechnetate form 10 to 310 k. entropy and gibbs energy. entropy of the aqueous pertechnetate ion., j. chem. thermodynamics, v. 4, pp. 77-84

BUSEY,G.A. and COWAN,H.D., 1950, behavior of plutonium(iii) chloride in titrations with base and acid., los alamos national laboratory, lanl-1105., 27p.

BUSEY,R.H. and MESMER,R.E., 1977, lonization equilibria of silica acid and polysilicate formation in aqueous sodium chloride to 300 deg. c., inorg. chem., v. 16, pp. 2444-2450.

BUSLAEV,Y., 1962, instability constants of complex zirconium flourides., russ. jour. inorg. chem., v. 7, pp. 619-620.

BYRNE,R.H. and KESTER,D.R. 1981, ultraviolet spectroscopic study of ferric equilibria at high chloride concentrations. j. solution chem., v. 10, pp. 51-67.

CARPENTIER,J.M., 1969, etude par electrophorese de la complexation de l'uranium(vi), de l'etian(ii) et du bismuth(iii)., bull. soc. chim. de france, v. 11, pp. 3851-3855.

CARREL,B. and OLLIN,A., 1960, studies on the hydrolysis of metal ions. 31. the complex formation between Pb24 and OH in Na(OH.CI04) medium., acta chem. scand., v. 14 pp. 1999-2008.

CHANDRATILLAKE,M.R., NEWTON,G.W.A. and ROBINSON.V.J., 1988, nuclear science and technology: chemval project; comparison of thermodynamic databases used in geochemical modelling, w.s.atkins engineering sciences, epsom, surrey, united kingdom.

CHASE,M.W., CURNUTT,J.L., HU,A.T., PROPHET,H., SYVERUD,A.N. and WALKER,L.C. 1974, janaf thermochemical tables, 1974 supplement., jour. phys. chem. ref. data, v. 3 pp. 311-480.

CHASE,M.W., CURNUTT,J.L., MCDONALD, B.A. and SYVERUD,A.N. 1975, janaf thermochemical tables, 1975 supplement., jour. phys. chem. ref. data v. 4, 176p.

CHASE,M.W., DAVIES,Q.A., DOWNEY,J.R., FRURIP,D.J., MCDONALD,R.A. and SYVERUD,A.N., 1985, janaf thermochemical tables third edition, 1985 supplement., jour. phys. chem. ref. data, v. 14, 1856p.

CHOPPING. and UNREIN,P., 1976, thermodynamic study of actinide fluoride complexation, in muller,w. and linder,r. (eds.), transplutonium 1975., 4th international transplutonium symposium, baden-baden, germany, p. 97-107.

CHRISTENSEN,J.J. and IZATT,R.M., 1983, handbook of metal ligand heats. 3rd.ed. marcel-dekker inc., new york, 781p.

CHUKHLANTSEV,V.G., 1956a, the solubility products of a number of arsenates, zhur. analit. khim., v. 11 pp. 565.

CHUKHLANTSEV,V.G., 1956b, solubility products of arsenates, zhur. neorg. khim., V. 1 pp. 1975-82.

CLARK,JR.,S.P. (ED.), 1966, handbook of physical constants geological society of america, inc. new haven, conn., 587p.

COBBLE,J.W., MURRAY,R.C., TURNER,P.J. and CHEN,K. 1982, high-temperature thermodynamic data for species in aqueous solution. epri report np-2400, research project 1167-1, 186p.

CODATA, 1976, recommended key values for thermodynamics. j. chem. thermo. v 8 pp. 603-605.

CODATA, 1977, recommended key values for thermodynamics. j. chem. thermo. v. 9 pp. 705-706.

CODATA, 1978, recommended key values for thermodynamics. j. chem. thermo. v. 10, pp. 903-906.

CONNICK,R. and MCVEY,W., 1949, the aqueous chemistry of zirconium amer. chem. soc. v. 71, pp. 3182-3191.

COOK,O.A., 1947, high-temperature heat contents of V203, V204, and V205., am. chem. soc. jour., v. 69, pp. 331-333.

CORDFUNKE,E.H.P. and O'HARE,P.A.G., 1978, the chemical thermodynamics of actinide elements and compounds-iii. miscellaneous actinide compounds., intl. atomic energy agency, vienna., p. 13-52.

CORDFUNKE,E.H.P., MUIS,R.P., OUWELTJES,W., FLOTOW,H.E. and O'HARE,P.A.G., 1982, the thermodynamic properties of na2uo4, na2u2O7, and nauo3. chem. thermo. v. 14, pp. 313-322.

COUGHLIN,J. and KING,E. , 1950, high-temperature heat contents of some zirconium-containing substances., am. chem. soc. jour., v. 72, pp. 2262-2265.

COUGHLIN,J.P., 1950, high-temperature heat contents of manganous sulfide ferrous sulfide and pyrite., amer. chem. soc. jour., v. 72, pp. 5445-5447.

COUGHLIN,J.P., 1955, high-temperature heat contents, heats of transition, and heat of fusion of anhydrous sodium sulfate., am. chem. soc. jour., v. 77, pp. 868-870.

COUGHLIN,J.P. and O'BRIEN,C.J., 1957, high temperature heat content of calcium orthosilicate. phys. chemistry, v. 61, pp. 767-769.

COUGHLIN,J.P., KING,E.G. and BONNICKSON,E.R., 1951, high-temperature heat contents of ferrous oxide, magnetite and ferric oxide., am. chem. soc. jour., v. 73, pp. 3891-3893.

COUTURIER,Y., MICHARD,G. and SARAZIN,G., 1984. constantes de formation des complexes hydroxydes de I'aluminium en solution aqueuse de 20 a 70 deg c., geochim. cosmochim. acta, v. 48, pp. 649-659.

COX,J.D., HARROP,D. and HEAD,A.J., 1979, the standard enthalpy of formation of ammonium nitrate and of the nitrate ion., j. chem. thermo., v. 11, pp. 811-814.

COX,J.D., WAGMAN,D.D. and MEDVEDEV,V.A., 1988, codata key values for thermodynamics, hemisphere publishing corporation, NY, 271p.

COX,J.D., WAGMAN,D.D. and MEDVEDEV,V.A., 1989, codata key values for thermodynamics, hemisphere publishing corporation, NY, 271p.

CRERAR,D.A. and BARNES,H.L., 1974, deposition of deep-sea manganese nodules., geochim. cosmochim. acta, v. 38, pp. 279-300.

CRERAR,D.A., SUSAK,N.J. and BORCSIK,M., 1978, solubility of the buffer assemblage pyrite + pyrrhotite + magnetite in nacl solutions from 200 to 350 c., geochim. cosmochim. acta v. 42, pp. 1427-1437.

CRISS,C.M. and COBBLE,J.W. , 1964, the thermodynamic properties of high temperature aqueous solutions. iv. entropies of the ions up to 200C and the correspondence principle, jour. amer. chem. soc., v. 86, pp. 5385-5390.

CRISS,C.M. and COBBLE,J.W., 1964, the thermodynamic properties of high temperature aqueous solutions. v. the calculation of ionic heat capacities up to 200C. Entropies and heat capacities above 200C, jour. amer. chem. soc., v. 86, pp. 5390-5393.

DATA BASE DEVELOPMENT GROUP III/1, 1988, data base additions - smectite end member volumes, lawerence livermore national laboratory internal memo.

DATA BASE DEVELOPMENT GROUP III/2, 1988, clinoptilolite endmembers and clinoptilolite solid solution, lawrence livermore national laboratory internal memo.

DATA BASE DEVELOPMENT GROUP 111/3, 1988, errors in computation of estimated delh298 for montmor-x endmembers of smectite-di solid solution., lawrence livermore national laboratory internal memo.

DATA BASE DEVELOPMENT GROUP 111/4 , 1988, thermodynamic data for cs-smectite solid solution endmembers, lawrence livermore national laboratory internal memo.

DATA BASE DEVELOPMENT GROUP VI/1, 1988, clinoptilolite endmembers and clinoptilolite solid solutions, lawrence livermore national laboratory internal memo.

DATA BASE DEVELOPMENT GROUP XII/1, 1988, data base changes for aluminium hydrolysis constants lawerence livermore national laboratory internal memo.

DATABASE DEVELOPMENT GROUP, 1989, database changes for the zeolite heulandite lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP, 1989, clinoptilolite - o'hare's single point data lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP, 1989, error report and resolution for zeolite gismondine, lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP, 1989, error report and resolution for species mn(oh)3, lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP 1989, zeolite thermodynamic data, lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP 1989, clinoptilolite solid solution end member thermodynamic data, lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP 1990, iron chloride stability constants, lawrence livermore laboratory internal memo.

DATABASE DEVELOPMENT GROUP 1990, zeolite volumes, lawrence livermore laboratory internal memo.

DEER,W.A., HOWIE,R.A. and ZUSSMAN,J., 1963, rock-forming minerals, vol. 4, framework silicates, john wiley and sons, inc., ny, 435p.

DELLIEN,I., HALL,F.M. and HEPLER,L.G., 1976, chromium, molybdenum, and tungsten: thermodynamic properties, chemical equilibria, and standard potentials., chemical reviews, v. 76, pp. 283-310.

DEM'YANETS,L.N., BUKIN,V.1., ENEL'YANOVA,E.N., and IVANOV,V.I., 1974, hydrothermal synthesis, x-ray diffraction, and thermogravimetric study of rare-earth hydroxychlorides ln(oh)2cl, soviet phys. cryst., v. 18(6), pp. 806-808.

DENNEY,T.O. and MONK,C.B., 1951, ion pair formation in thiosulfate solutions, trans. faraday soc., v. 33, pp. 992-998.

DONGARRA,G. and LANGMUIR,D. , 1980, the stability of uo2oh+ and uo2(hpo4)2- complexes at 25c., geochim. cosmochim. acta, v. 44, pp. 1747-1751.

DONNAY,J.D.H. (ED.) 1978, crystal data determinative tables, 3rd ed., vol.4; inorganic compounds 1967-69 nsrds and jcpds.

DONNAY,J.D.H. and ONDIK,H.M. (EDS.), 1973, crystal data determinative tables,3rd ed., vol 2; inorganic compounds, nsrds and jcpds, v. 2.

DOUGLAS,T.B. and DITMARS,D.A., 1967, measured relative enthalpy of anhydrous crystalline aluminum trifluoride, ALF3 from 273 to 1173 k and derived thermodynamic properties from 273 to 600 k., u.s. natl. bur. standards jour. research, v. 71, pp. 185-193.

DOUSMA,J., DEN OTTELANDER,D. and DE BRUYN,P.L., 1979, the influence of sulfate ions on the formation of iron(iii) oxides., j. inorg. nucl. chem., v. 41, pp. 1565-1568.

DRUMMOND,S.E., 1981, boiling and mixing of hydrothermal fluids: chemical effects on mineral precipitation., pennsylvania state univ., state college, pa (unpublished ph.d. dissertation).

DUTT,N.K. and GUPTA,A., 1961, fluorarsenates and their analogues with sulphates. part iii. stability of fluorarsenate ion and its comparison with fluorphosphate ion., j. indian chem. soc., v. 38, pp. 249-252.

EDELSTEIN,N., BUCHER,J., SILVA,R. and NITSCHE,H., 1983, thermodynamic properties of chemical species in nuclear waste., lawrence berkeley laboratory report, lbl-14325, 125p.

EGAN,E.P., WAKEFIELD,Z.T. and LUFF,B.B., 1961, low temperature heat capacity, entropy and heat of formation of crystalline and colloidal ferric phosphate dehydrate., jour. phys. chemistry, v. 65, pp. 1265-1270.

EGAN,E.P.,JR, WAKEFIELD,Z.T. and ELMORE,K.L., 1950, high-temperature heat content of hydroxyapatite., am. chem. soc. j. our. v. 72, pp. 2418-2421.

ELGQUIST,B. and WEDBORG,M., 1975, stability of ion pairs from gypsum solubility. degree of ion pair formation between the major constituents of seawater., marine chem., v. 3 pp. 215-225.

ELGQUIST,B. and WEDBORG,M., 1978, stability constants of naso4-, mgso4, mgf+, mgcl+ ion pairs at the ionic strength of seawater by potentiometry., marine chem., v. 6, pp. 243-252.

EMERSON,S., 1976, early diagenesis in anaerobic lake sediments: chemical equilibria in interstitial waters., geochim. cosmochim. acta, v. 40, pp. 925-934.

EYRING,L. (ED.), 1966, progress in the science and technology of the rare earths, vol. 2, pergamon press, oxford, p. p97

FABRE,C., 1887, recherches thermiques sur les seleniures., annuls. chem. phys., v. 10 pp. 472.

FERRANTE,B., STUVE,J. and RICHARDSON,D., 1976, thermodynamic data for synthetic dawsonite., u.s. bur. mines rept. 8129, p. 13.

FERRI,D., GRENTHE,I., HIETANEN,S. and SALVATORE,F., 1983, studies on metal carbonate equilibria. 5. the cerium(iii) carbonate complexes in aqueous perchlorate media., acta chemica scand. (preprint).

FLOTOW,H.E., OSBORN,D.W., FRIED,S.M. and MALM.J.G., 1976, heat capacity of 242-puo2 from 12 to 350 degrees k and of 244-puo2 from 4 to 25 degrees k. entropy, enthalpy, and gibbs energy of formation of puo2 at 298.15 degrees k., j. chem. phys., v. 63 pp. 1224-1229.

FREDRICKSON,D.R. and CHASANOV,B.G., 1970, enthalpy of uranium dioxide and sapphire to 1500 k by drop calorimetry., jour. chem. thermodynamics, v. 2, pp. 623-630.

FUGER,J. and OETTING,F.L., 1976, the chemical thermodynamics of actinide elements and compounds-ii. the actinide aqueous ions., intl. atomic energy agency, vienna., p. 16-60.

GALAL-GORCHEV,H. and STUMM,W., 1963, the reaction of ferric iron with orthophosphate. J. inorg. nucl. chem., v. 25, pp. 567-574.

GARRELS,R.M. and CHRIST,C.L., 1965, solutions, minerals, and equilibria, harper and row p. 411.

GARVIN,D., PARKER,V.B. and WHITE,JR.,H.J., 1987, codata thermodynamic tables: selections for some compounds of calcium and related mixtures: a prototype set of tables, hemisphere publishing corporation, washington, 356p

GINNINGS,D.C. and CORRUCCINI,R.J., 1947, heat capacities at high temperatures of uranium. uranium trichloride, and uranium tetrachloride., u.s. natl. bur. standards jour. v. 39, pp. 309-316.

GREEN,J.H.S., 1961, thermodynamic properties of organic oxygen compounds., quarterly reviews, p. 125-153.

GRENIER,G. and WESTRUM,E., 1956, the heat capacity and thermodynamic functions of sodium metaborate from 5 to 350 k., jour. amer. chem. soc., v. 78, pp. 6226-6227.

GRONVOLD,F., 1968, heat capacities and thermodynamic properties of the iron selenides Fel.04Se, Fe7Se8, and Fe3Se4 from 298 to 1050 k., acta chem. scand., v. 22, pp. 1219-1240.

GRONVOLD,F., 1973, heat capacities and thermodynamic properties of hexagonal and liquid selenium in the range 298 to 1000 k. enthalpy and temperature of fusion., jour. chem. thermodynamics, v. 5, pp. 525-531.

GRONVOLD,F., 1975, heat capacity and thermodynamic properties of bismuth in the range 300 to 950 k. fusion characteristics., acta chem. scandinavica, v. 29a, pp. 945-955

GRONVOLD,F., KVESETH,N.J., SVEEN,A. and TICHY,J., 1970, thermodynamics of the U02+ phase 1. heat capacities of U02.017 and U02.54 form 300 to 1000 k and electronic contributions., jour. chem. thermodynamics, v. 2, pp. 665-680.

GRONVOLD,F., WESTRUM,F. and CHOU,C., 1959, heat capacities and thermodynamic properties of pyrrhotites FeS and Feo.887S from 5 to 350 k., jour. chem. physics, v. 30 pp. 528-531.

HANNA,E.M., PETHYBRIDGE,A.D. and PRUE,J.E., 1971, ion association and the analysis of precise conductimetric data., electrochim. acta, v. 10, pp. 677-686.

HARVIE,C.E., 1981, theroretical investigations in geochemistry and atom surface scattering. univ. california, san diego (unpublished ph.d. dissertation).

HARVIE,C.E. and WEARE,J.H., 1980, the prediction of mineral solubilities in natural waters: the na-k-mg-ca-cl-so4-h2o system from zero to high concentration at 25 c., geochim. cosmochim. acta, v. 44, pp. 981-997.

HARVIE,C.E., MOLLER,N. and WEARE,J.H., 1984, the prediction of mineral solubilities in natural waters: the na-k-mg-ca-h-cl-so4-oh-hco3-co3-co2-h2o system to high ionic strengths at 25 c., geochim. et cosmochim acta, v. 48, pp. 723-751.

HELGESON,H.C. 1969, thermodynamics of hydrothermal systems at elevated temperatures and pressures. amer. jour. sci., v. 267, pp. 729-804.

HELGESON,H.C. 1983, supcrt update unpublished note, jan. 31,1983., 3p.

HELGESON,H.C. and KIRKHAM,D.H. 1974a, theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures. i. summary of the thermodynamic/electrostatic properties of the solvent., amer. j. sci., v. 274, pp. 1089-1198.

HELGESON,H.C. and KIRKHAM,D.H., 1974b, theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures. ii. debye-huckel parameters for activity coefficients and partial molal properties., amer. sci., v. 274, pp. 1199-1261.

HELGESON,H.C. and KIRKHAM,D.H., 1976, theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures. iii. equation of state for aqueous species at infinite dilution., amer. j. sci., v. 276, pp. 97-240.

HELGESON,H.C., DELANY,J.M., NESBITT,H.W. and BIRD,D.K., 1978, summary and critique of the thermodynamic properties of rock-forming minerals., amer. j. sci., V. 278-a, 229p.

HELGESON,H.C., KIRKHAM,D.H. and FLOWERS,G.C., 1981, theoretical prediction of the thermodynamic behavior of aqueous electrolytes at high pressures and temperatures. iv. calculation of activity coefficients, osmotic coefficients, and apparent molal and standard and relative partial molal properties to 600 c and 5 kb., amer. jour. sci., v. 281, pp. 1249-1516.

HEM,J.D., 1980, redox coprecipitation mechanism of manganese oxides, in kavanaugh, m.c. and leckie, J.o., (eds.), particulates in water., am. chem. society, advances in chemistry series v. 189, pp. 45-72.

HEMINGWAY,B.S., 1982, thermodynamic properties of selected uranium compounds and aqueous species at 298.15 k and 1 bar and at higher temperatures - preliminary models for the origin of coffinite deposits., u.s. geological survey open-file report 82-619, 90p.

HEMINGWAY,B.S., 1987, quartz: heat capacities from 340 to 1000 k and revised values for the thermodynamic properties, amer. mineral., v. 72, pp. 273-279.

HEMINGWAY,B.S. and ROBIE,R.A., 1977, enthalpies of formation of low albite (NaAlSi3O3), gibbsite (Al(OH)3), and NaIO2 revised values for Hf,298 and Gf,298 of alumina-silicates. u.s. geol. survey jour. research, v. 5, pp. 413-429.

HEMINGWAY,B.S., ROBIE.R.A., KITTRICK,J.A., GREW,E.S., NELEN,J.A. and LONDON,D. 1984, the heat capacities of osumilite from 298.15 to 1000k, the thermodynamic properties of two natural chlorites to 500k, and the thermodynamic properties of petalite to 1800k., amer. mineral., v. 69, pp. 701-710.

HEPLER,L.G, 1958, thermodynamics of aqueous hydrogen chromate and dichromate ions. heats of formation of chromates and dichromates., jour am. chem. soc., v. 80, pp. 6181-3.

HOGFELDT,E., 1982, stability constants of metal-ion complexes, part a, inorganic ligands. iupac chem.data series no.21, pergamon press, oxford, 310p

HOWELL,D.A., JOHNSON,G.K., TASKER,I.R., O'HARE,P.A.G. and WISE, W.S, 1990, thermodynamic properties of the zeolite stilbite, zeolites, v. 10, pp. 525-531.

HUBER,E., HEAD,E., and HOLLEY,C., 1964, the heats of formation of zirconium diboride and dioxide., jour. phys. chem., v. 68 pp. 3040-3042.

HULL,H. and TURNBULL,A. , 1973., a thermochemical study of monohydrocalcite , geochim. et cosmochin. acta., v. 37, pp. 685-694.

HULTGREN,R., DESAI,P.D., HAWKINS,D.T., GLEISER,M., KELLEY,K.K. and WAGMAN,D.D., 1973, selected values of the thermodynamic properties of the elements. amer. soc. for metals, metals park, ohio, 636p.

HURLBUT, JR., C.S. (ED.), 1971, dana's manual of mineralogy, 18th ed., John wiley & sons, inc., ny, 579p.

INCHEY,R.J. and COBBLE,J.W., 1970, the thermodynamic functions of pu3+(aq) and the entropies for some trivalent actinide ions., inorg. chem., v. 9, pp. 922-926.

INGRI,N., 1963, equilibrium studies of polyanions. ii. polyborates in 3.0 m na(br), 3.0 mli (br) and 3.0 m k(br), a comparison with data obtained in 3.0 m na(clo4)., acta chem. scand. v. 17, pp. 581-589.

ISRAEL,Y. and MEITES,L. , 1976, vanadium, in bard, a.i. (ed.), encyclopedia of electrochemistry of the elements., marcel dekker, new york., v. 7, pp. 293-453.

IUKKOLA,K. and WAGNER,C., 1957, measurements on galvanic cells involving solid electrolytes., J. electrochem. soc., v. 104, pp. 379-387.

IVAKIN, A.A. and VORONOVA,E.M., 1969, complex formation in vo2+—f—h2o system, zhur, neorg, khim. (russian j. inorg, chem.), v. 14 pp. 1557(815-18).

IVAKIN,A.A. KURBATOVA,L.D. and VORONOVA,E.M., 1974, a spectrophotometric study of vanadium(v) phosphate complexes in aqueous solutions, zhur. neorg. khim. (russian j. inorg. chem.), v. 19, pp. 714(387-89).

IVAKIN,A.A., YATSENKO,A.P. and MATVEEDA,N.S., 1973, solubility of the products of the hydrolytic precipitation of vanadium in perchloric, nitric, and sulfuric acids, zhur. neorg. khim. (russian j. inorg. chem.), v. 18, pp. 2100(1111-3).

IZATT,R.M., EATOUGH,D., CHRISTENSEN,J.J. and BARTHOLOMEW, C.H., 1969b, calorimetrically determined log k, delh0, and dels0 values for the interaction of suphate ion with several bi- and ter-valent metal ions. , j. chem. soc. a., p. 47-53.

JACKSON,K.J. and HELGESON,H.C., 1984, chemical and thermodynamic constraints on the hydrothermal transport and deposition of tin. 1.calculation of the solubility of cassiterite at high pressures and temperatures., geochim. et cosmochimica acta., v. 49, 22p.

JACKSON,K.J. and HELGESON,H.C., 1985, chemical and termodynamic constraints on the hydrothermal transport and deposition of tin: II. interpretation of phase relations in the southeast asian tin belt, economic geology, v. 80, pp. 1365-1378.

JACOB,K.T. and ALCOCK,C.B., 1975, the oxygen potential of the systems fe+fecr2o4+cr2o3 and fe+fev2o4+v2o3 in the temperature range 750-1600c., met. trans. b., v. 6b, pp. 215-221.

JANECKY,D.R., 1982, serpentinization of peridotite within the oceanic crust: experimental and theoretical investigations of seawater-peridotite interaction at 200c and 300c, 500 bars., university of minnesota, minneapolis, minnesota (unpublished ph.d. dissertation), 244p.

JANZ,G.J., KELLY,F.J. and PERANO,J.L., 1963, melting and pre-melting effects in the alkaline earth halides., trans. faraday soc., v. 59, pp. 2718-2722.

JENKINS,R. (ED.), 1986, mineral powder diffraction file, jcpds international centre for diffraction data, swarthmore, penn.

JOHNSON, G.K., FLOTOW,H.E., O'HARE,P.A.G. and WISE,W.S., 1983, thermodynamic studies of zeolites: natrolite, mesolite, and scolecite., am. mineral., v.68, pp. 1134-1145.

JOHNSON, G.K., FLOTOW,H.E., O'HARE,P.A.G. and WISE,W.S., 1985, thermodynamic studies of zeolites: heulandite., am. mineral., v. 70, pp. 1065-1071.

JOHNSON,G.K., TASKER,I.R., FLOTOW,H.E. and WISE,W.S., 1986, thermodynamic studies of zeolites: mordenite and dehydrated mordenite., presented at the zeolite symposium of the 23rd annual clay minerals society meeting, Jackson, Mississippi, october, 1986 , 2p.

JOHNSON,G.K., TASKER,I.R., JURGENS,R. and O'HARE, P.A.G., 1991a, thermodynamic studies of zeolites: clinoptilolite, the journal of chemical thermodvnamics, v. 23, pp. 475-484.

JOHNSON,J.W., OELKERS,E.H., and HELGESON,H.C., 1991, supcrt91: a software package for calculating the standard molal thermodynamic properties of minerals, gases, aqueous species, and reactions from 1 to 5000 bars and 0 to 1000 c, submitted to computers and geosciences.

JOHNSON,K.S., 1982, solubility of rhodochrosite (mnco3) in water and seawater., geochim. cosmochim. acta, v. 46, pp. 1805-1809.

JOHNSON,K.S. and PYTKOWICZ,R.M., 1979, ion association and activity coefficients in multicomponent systems, in pytkowicz, r.m., (ed.), activity coefficients in electrolyte solutions., crc press inc., boca raton, fl. v. 2, pp. 1-62.

KAPUSTINSKII,A.F. and GOLUTVIN,Y.M., 1951, heat of formation of iron selenide heat range method (in russian), zhur. fiz. khim., v. 25, pp. 729-31.

KARAPET'YANTS,M.KH. and KARAPET'YANTS,M.L., 1970, thermodynamic constants of inorganic and organic compounds (translated by schmorakj. isreal program for scientific transkations), ann arbor - humphrey science publishers.

KASHKAY,CH.M., BOROVSKAYA,YU.B. and BABAZADE,M.A., 1975, determination of delgOf298 of synthetic jarosite and its sulfate analogues., geochem. internat., v. 12, pp. 115-121.

KATZ,J.J. and SEABORG,G.T., 1957, the chemistry of the actinide elements, wiley, new vork, P. 52-66.

KEE,R.J., RUPLEY,F.M. and MILLER,J.A., 1987, the chemkin thermodynamic data base, sandia national laboratory report sand-87-8215, 92p.

KELEMEN,F., CRUCEANU,E. and MICULESCU,D., 1965, untersuchung einiger thermischer eigenschaften der verbindungen HgSe, HgTe and ZnTe., phys. stat. solidi., v. 11, pp 865-872.

KELLEY,K.K. , 1939, the specific heats at low temperatures of manganese, manganous selenide and manganous telluride., j. am. chem. soc. , v. 61 , pp. 203-207.

KELLEY,K.K., 1949, high-temperature heat-content, heat-capacity, and entropy data for inorganic compounds., u.s. bur. mines. bull no. 476, 4p.

KELLEY,K.K., 1950. entropies of inorganic substances: revision of data. u.s. bur. mines. bull no. 477., p. 93-94.

KELLEY.K.K., 1960. contributions to the data on theoretical metallurgy, xiii. high-temperature heat-content, heat-capacity, and entropy data for the elements and inorganic compounds., u.s. bureau of mines bulletin 584., 232p.

KELLEY,K.K. and CHRISTENSEN,A.U., 1961, high-temperature heat content and entropies of crystalline germanium dioxide., u.s. bur. mines rept inv. 5710, 5p.

KELLEY.K.K. and KING,E.G., 1961, contributions to the data on theoretical metallurgy. xiv. entropies of the elements and inorganic compounds., u.s. bureau of mines bulletin 592, 149p.

KELLEY,K.K., SHOMATE,C.H., YOUNG,F.E., NAYLOR,B.F., SALO,A.E. and HUFFMAN,E.H., 1946, thermodynamic properties of ammonium and potassium alums and related substances, with reference to extraction of alumina from clay and alunite., u.s. bur. mines tech. paper 688, 104p.

KENNEDY,M.B. and LISTER,M.B., 1966, heats of association of aqueous copper, nickel, and cobalt ions with halide ions, canadian jour. chem., v. 44, pp. 1709-1717.

KERRISK,J.F. 1983, new manganese thermodynamic data for the eq3/6 data base, los alamos national laboratory internal memorandum, 23p.

KERRISK.J.F., 1984, americium thermodynamic data for the eq3/6 data base., los alamos national laboratory la-10040-ms., 39p.

KERRISK,J.F. and SILVA,R.J., 1986, a consistent set of thermodynamic constants for americium(iii) species with hydroxyl and carbonate, LLNL to be published (presented at fallen leaf lake 1986) 11p.

KHOPKAR,P.K. and NARAYANANKUTTY,P., 1971, effect of ionic media on the stability constants of chloride, nitrate and thiocyanate complexes of americium(iii) and europium (iii), jour. inorg. nucl. chem., v. 33, pp. 495-502.

KIMURA,T., MORINAGA,K. and NAKANO,K., 1972, the determination of association constant of vanadium(iii) with sulfate ion, nippon kagaku kaishi, v. 3, pp. 667-668.

KING, E., WELLER,W., 1970, low temperature heat capacities and entropies at 298.15 k of geothite and pyrophyllite., u.s. bur. mines rept. 7369, p. 6.

KING,E.G. and CHRISTENSEN,A.U,JR., 1958, heat contents above 298.15 k of oxides of cobalt and nickel, am. chem. soc. jour., v. 80 pp. 1800-1801.

KIRSCHNING,H.J., PLIETH,K. and STRANSKI,I.N., 1954, thermodynamic research of systems of cubic and monoclinic arsenic modifications., z. kristallogr, v. 106, pp. 172-182.

KISELEVA,I.A., TOPOR,N.D. and MEL'CHAKOVA,L.V., 1972, experimental determination of the heat content and heat capacity of grossularite, andradite, and pyrope., geochem. internat., v. 9, pp. 1087.

KLINTSOVA,A.P. and BARSUKOV,V.L., 1973, solubillty of cassiterite in water and in aqueous NaOH solutions at elevated temperatures., geochem. int., v. 1973, pp. 540-547.

KLOTZ,C. and BENSON,B., 1963, thermodynamic properties of the atmosphereic gases in aqueous solutions., J. phys. chem., v. 67, pp. 933-934.

KOBAYASHI,K., 1952b, the heat capacities of inorganic substances at high temperatures part vii. the heat capacities of sodium carbonate and sodium bicarbonate., the science report tohoku univ., v. 36, pp. 21-26.

KRUPKA,K.M., JENNE,E.A. and DEUTSCH,W.J. 1982, validation of the wateq4 geochemical model for uranium., battelle pacific northwest laboratories, pni-4333., 183p.

KUBASCHEWSKI,O., 1970, the thermodynamic properties of double oxides. national physical laboratory division of chemical standards., p. 28.

KUBASCHEWSKI,O., 1972, the thermodynamic properties of double *oxides. high temperatures-high pressures, v. 4, 12p.

KUBASCHEWSKI,O. and ALCOCK,C.B., 1979, metallurgical thermochemistry. 5th ed. pergamon press, oxford.

KUBLANOVSKII,V.S. and BELINSKII,V.N. , 1972, formation of ammonia complexes of manganese(ii), zhur. neorg. khim. (russian inorg. chem.), v. 17, pp. 129 (68-69).

KUYUNKO,N.S., MALININ,S.D. and KHODAKOVSKIY,I.L., 1983, an experimental study of aluminum ion hydrolysis at 150, 200 and 250 c., geokhimiya, v. 3, pp. 76-86.

LA IGLESIA,A. and AZNAR,A.J. 1986, a method of estimating the gibbs energies of formation of zeolites, zeolites v. 6, pp. 26-69.

LANDER,J.J., 1951, experimental heat contents of SrO, BaO, CaO, BCO, and SrCO3 at high temperatures. dissociation pressures of BCO, and SrCO3, am. chem. soc. jour., v. 73 pp. 5794-5797.

LANGMUIR,D. 1969, the gibbs free energies of substances in the system fe-o2-h2o-co2 at 25 c., u.s. geol. survey prof. paper 650-b, p. 180-183.

LANGMUIR,D., 1978, uranium solution-mineral equilibria at low temperatures with applications to sedimentary ore deposits. , geochim. cosmochim. acta, v. 42, pp. 547-569.

LANGMUIR,D. , 1979, techniques of estimating thermodynamic properties for some aqueous complexes of geochemical interest, in jenne,e.a. (ed.), chemical modeling in aqueous systems. am chem. societv, advances in chemistry series 93, p. 353-387.

LANGMUIR,D. and DONGARRA,G. , 1982, the stabiiitv of uo2oh+ and uo22(hpo4)2- complexes at 25c (reply to a comment by v.s. tripathi), geochim. cosmochim. acta, v. 46 pp. 2005.

LANGMUIR,D. and HERMAN,J.S., 1980, the mobility of thorium in natural waters at low temperatures., geochim. cosmochim. acta, v. 44, pp. 1753-1766.

LATIMER,W.M., 1952, the oxidation states of the elements and their potentials in aqueous solutions., prentice-hall, inc., p. 280-283, 331.

LEBEDEV,I., FRENKEL,V., KULYAKO,YU. and MYASOEDOV,F. 1979, investigation of complex formation of americium(iii) and americium(iv) in phosphoric acid solutions. radiokhimiya , v. 21 , pp. 809-816.

LEMIRE,R.J., 1984, an assessment of the thermodynamic behavior of neptunium in water and model groundwater from 25 to 150 c., aecl-7817, atomic energy of canada limited, pinawa, manitoba, canada, 53p.

LEMIRE,R.J. and TREMAINE,P.R., 1980, uranium and plutonium equilibria in aqueous solutions to 200 deg c. chem. eng. data, v. 25, pp. 361-370.

LU,J.C.S. and CHEN,K.Y. 1977, migration of trace metals in interfaces of seawater and pollutes surficial sediments., environ. sci. technol., v. 11, pp. 174-182.

LUNDQVIST,R., 1982, hydrophilic complexes of the actinides. i. carbonates of trivalent americium and europium., acta chemica scand., v. 36, pp. 741-750

MACDONALD,D.D., 1976, the thermodynamics and theoretical corrosion behavior of manganese in aqueous systems at elevated temperatures., corrosion science, v. 16, pp. 461-482.

MAH,A.D. , 1954, heats of formation of chromium oxide and cadmium oxide from combustion calorimetry., jour. am. chem. soc., v. 76, pp. 3363-3365.

MAH,A.D. , 1960, thermodynamic properties of manganese and its compounds. , u.s. bur. mines. rept. inv. 5600, 34p.

MAH,A.D., PANKRATZ,L.B., WELLER,W.W. and KING,E.G., cuprous and cupric oxides., u.s. bur. mines rept. inv. 7026.

MARTELL,A.E. and SMITH,R.M., 1977, critical stability constants, vol. 3: other organic ligands., plenum press, new york., v. 3.

MARTELL,A.E. and SMITH,R.M. 1981, critical stability constants., vol. 4: inorganic complexes., plenum press, new york, v. 4, 257p.

MARTELL,A.E. and SMITH,R.M. 1982, critical stability constants, vol.5: first supplement., plenum press, new york, 604p.

MARTELL,A.E. and SMITH,R.M. 1989, critical stability constants, vol.3: other organic ligands., plenum press, new york, v. 3, 495p.

MATTIGOD,S.V. and SPOSITO,G. , 1977, estimated association constants for some complexes of trace metals with inorganic ligands. soil., sci., soc. amer. j., v. 41, pp. 1092-1094.

MATTIGOD,S.V. and SPOSITO,G., 1979, chemical modeling of trace metal equilibria in contaminated soil solutions using the computer program geochem. in jenne,e.a. (ed.), chemical modeling in aqueous systems., Am chem. society, symp 93., p. 837-856.

MAYA,L., 1982, hydrolysis and carbonate complexation of dioxouranium(vi) in the neutral-ph range at 25 deg. c., inorg. chem., v. 21, pp. 2895-2898.

MAYER,S.W., OWENS,B.B., RUTHERFORD,T.H. and SERRINS,R.B. 1960, high-temperature free-energy, entropy, enthalpy and heat capacity of thorium sulfate., J. phys. chem., v. 64, pp. 911-914.

MAZUMDAR.A.S. and SIVARAMAKRISHNAN,C.K., 1965, a study of the nitrate and the chloride complexes of plutonium(vi) by solvent extraction techniques using tta as the chelating agent., j. inorg. nucl. chem., v. 27, pp. 2423-2427.

MCGLYNN,S. and SMITH,J., 1961, the electronic structure, spectra, and magnetic properties of actinyl ions. part ii. neptunyul, and the ground states of other actinyls, jour. molecular spectroscopy, v.6, pp. 188-198.

MCHEDLOV-PETROSYAN,O.P. and BABUSHKIN.W.I., 1962, thermodynamics of the hardening processes of cement, in chemistry of cement proceedings of the fourth international symposium, wash., v. 1, pp. 533-544.

MCMASTERS,O.D., GSCHNEIDNER,K.A.,JR., KALDIS,E. and SAMPIETRO,G., 1973, high temperature heat contents of the europium chalcogenides, euo, sus, suse and eute., rare earth research conf., 10th, vienna, v. 2, pp. 970-975.

MESMER,R.E., BAES,C.F.,JR. and SWEETON,F.H., 1972, acidity measurements at elevated temperatures. vi. boric acid equilibria., inorg. chem., v. 11, pp. 537-543.

METIVIER,H. 1973, contribution a l'etude de l'hydrolyse du plutonium tetravalent et de sa complexation par des acides d'interet biloglque., commissariat a l'energie atomique, rapport cea-r-4477., 88p.

MILLS,K.C., 1974, thermodynamic data for inorganic sulphides, selenides and tellurides., butterworths, london., 845p.

MOORE,G.E., 1943a, heat content of manganese dioxide and carbonate at high temperature., jour. amer. chem. soc., v. 65, pp. 1398-1399.

MOORE,G.E., 1943b, heat contents at high temperature of the anhydrous chlorides of calcium, iron, magnesium and manganese., jour. amer. chem. soc., v. 65 7 pp. 1700-1703.

MORRIS,D.C.F. and STURGESS,P.J., 1969, formation of an iron(iii) nitrate complex, electrochim. acta, v. 14, pp. 629-31.

MORSS,L.R., 1986, thermodynamic properties, in katz,t.t., seaborg, g.t., and morss,l.r.(eds.), the chemistry of the actinide elements, 2nd ed, chapman and hall, ny, v. 2, pp. 1278-1360.

MOSKVIN,A., 1971, investigation of the complex formation of trivalent plutonium, americium, and curium in phosphate solutions., radiokhimiya, v. 13, pp. 668-674.

MOSKVIN.A. and POZNYAKOV,A., 1979, coprecipitation study of complex formation by neptunium(v), plutonium(v), and americium(v) with the anions of various inorganic acids., zhurnal neorganicheskoi khimmi, v. 24, pp. 2449-2457.

MOSKVIN,A.I., 1969, complex formation of the actinides with anions of acids in aqueous solutions., soviet radiochem., v. 17, pp. 447-449.

MOSKVIN,A.I., 1970, complex formation by plutonium(lv) in sulfate solutions., russ. j. inorg. chem., v. 15, pp. 1756-1757.

MOSKVIN,A.I. and GEL'MAN,A.D., 1958, determination of the composition and instability constants of oxalate and carbonate complexes of pu(lv)., zh. neorg. khim., v. 3 pp. 962-974.

MOSKVIN,A.I. and ZAITSEVA,V.P., 1962, hydrolytic behavior of plutonyl in aqueous solutions., radiokhim., v. 4, pp. 73-81.

MOSKVIN,A.I., ESSEN,L.N. and BUKHTIYAROVA,T.N., 1967, the formation of thorium(iv) complexes in phosphate solutions., russ. J. inorg. chem, v. 12, pp. 1794-5

MULDER,H.D. and SCHMIDT,F.C., 1951, heats of solution and reaction in liquid ammonia. viii., J. am. chem. soc., v. 73, pp. 5575-5577.

MULLICA,D.F., MILLIGAN,W.O. and BEALL,G.W., 1979, crystal structures of pr(oh)3, eu(oh)3, and tm(oh)3, journal of inorganic nuclear chemistry, v. 41, pp. p525-532.

MUSTAJOKI,A., 1951, messungen der wahren spezifischen warme de kcl-kbr-mischkristalle im temperaturberelch 50-450 c, suomalainen tiedeakatemia toimituksia, v. 98, pp. 7-45,

NAIR,V.S. and NANCOLLAS,G.H. , 1959, thermodynamics of ion association. part 6: some transition metal sulphates., j. chem. soc., p. 3934.

NASH,K.L. and CLEVELAND,J.M. , 1983, free energy, enthalpy and entropy of plutonium (iv) - sulfate complexes., radiochimica acta, v. 33, pp. 105-111.

NASH,K.L. and CLEVELAND,J.M. , 1984, the thermodynamics of plutonium (iv) complexation by fluoride and its effect on plutonium (iv) speciation in natural waters., radiochimica acta, v. 36, pp. 129-134.

NAUMOV,G.B., RYZHENKO,B.N. and KHODAKOVSKY,I.L. , 1974, handbook of thermodynamic data., u.s. geol. surv. wrd-74-001., 328p.

NAYLOR,B.F., 1944, high-temperature heat contents of ferrous and magnesium chromites., ind. eng. chemistry, v. 36, pp. 933-934.

NAYLOR,B.F. , 1945, heat contents at high temperatures of magnesium and calcium flourides., am. chem. soc. jour., v. 67, pp. 150-152.

NAZARENKO,V. and MANDZHGALADZE,O. 1969, determination of the formation constants of hydroxo-complexes of zirconium by the method of competing reactions., russ. jour. of inor. chem., v. 14, pp. 639-643.

NELSON.T., MOSS.C. and HEPLER,L. , 1960. thermochemistry of potassium permanganate,potassium molvbdate,potassium chlorate,sodium chlorate,sodium chromate and sodium dichromate., phys. chem., v. 64, pp. 376-377.

NEWBERG,D., 1967, geochemical implications of chrysocolla-bearing alluvial gravels., econ. geol., v. 62, pp. 932-956.

NEWTON,T.W. and BAKER,F.B., 1957, chloride complex ions of PU(VI), j. physical chemistry, v. 61, pp. 934-938.

NIKOLAEVA,N.M. and TSVELODUB.L.D., 1977, complex formation by fe(iii) with chlorides in aqueous solution at high temperatures., russ. J. inorg. chem., v. 22, pp. 205-209.

NIKOLSKII,B.P., PALCHEVSKII,V.V. and GORBUNOVA,R.G. 1961, oxidation-potential study of acetate complex formation in the ferric-ferrous system., russ. J. inorg. chem., v. 6, pp. 309-312.

NORDSTROM,D.K. and JENNE,E.A., 1977, fluorite solubility equilibria in selected geothermal waters, geochim. cosmochim. acta, v. 41, pp. 175-188.

NRIAGU,J. 197, solubility equilibrium constant of strengite., amer. jour. of sci., v. 272 pp. 476-484.

NRIAGU.J.0., 1972a, stability of vivianite and ion-pair formation in the system fe3(po4)2-h3po4-h2o., geochim. cosmochim. acta, v. 36, pp. 459-470.

NRIAGU.J.0., 1972b, lead orthophosphates. i. solubility and hydrolysis of secondary lead orthophosphate, inorg. chem., v. 11, pp. 2499-2503.

NRIAGU,J.0., 1973, lead orthophosphates-ii. stability of chloropyromorphite at 25 c., geochim. cosmochim. acta, v. 37, pp. 367-377.

NRIAGU,J.0., 1974, lead orthophosphates-iv. formation and stability in the environment. geochim. cosmochim. acta, v. 38, pp. 887-898.

NUCLEAR ENERGY AGENCY , 1986, chemical thermodynamics of uranium, draft report, oecd nuclear energy agency division of radiation protection and waste management, v. 41, 161p.

NUCLEAR ENERGY AGENCY, 1990, chemical thermodynamics of uranium (final draft of march 1990), oecd nuclear energy agency, data bank, 655p.

O'BRIEN,C.J. and KELLEY.K.K., 1957, high temperature heat contents of cryolite, anhydrous aluminum fluoride and sodium fluoride., am. chem. soc. jour., v. 79, pp. 5616-5618.

O'HARE,P.A.G., 1972, thermochemical and theoretical investigations of the sodium-oxygen system. part 1. the standard enthalpy of formation of sodium oxide (Na2O)., jour. chem. physics, v. 56, pp. 4514-4516.

O'HARE,P.A.G., LEWIS,B.M. and NGUYEN,S.N., 1988, thermochemistry of uranium compounds, xvii. standard molar enthalpy of formation at 298.15 k of dehydrated schoepite uo3.0.9h2o. thermodynamics of (schoepite + dehydrated schoepite + water)., lawrence livermore national laboratory, ucrl-21053 s/c 610-007, 19p.

OBERSON,C.E. and BARNES,R.B., 1978, stability of fluoride complex with silica and its distribution in natural water systems., chem. geol., v. 21, pp. 239-256.

OBIE,R.A., HEMINGWAY,B.S. and FISHER,J.R., 1978, thermodynamic properties of minerals and related substances at 298.15 k and 1 bar (10(5) pascals) pressure and at higher temperatures., u.s. geological survey bulletin 1452.

OETTING,F.L. 1967, the chemical thermodynamic properties of plutonium compounds., chem. rev., v. 67, pp. 261-297.

OETTING,F.L., RAND,M.H. and ACKERMAN,R.J., 1976, the chemical thermodynamics of actinide elements and compounds, part i. the actinide elements., iaea, vienna., 113p.

OLLIN,A., 1960, studies on the hydrolysis of metal ions 25. the hydrolysis of lead(ii) in perchlorate medium., acta chem. scand, v. 14, pp. 126-150.

OLSON,L.L. and O'MELIA,C.R., 1973, the interactions of fe(iii) with si(oh)4., J. inorg. nucl. chem. v. 35, pp. 1977-1985.

ORR,R.L. 1954, high temperature heat contents of manganese sesquioxide and vanadium monoxide., am. chem. soc. jour., v. 76, pp. 857-858.

ORR,R.L. and CHRISTENSEN,A.U. 1958, high temperature heat contents of stannous and stannic sulfides., jour. phys. chemistry, v. 62, pp. 124-125.

OSBORN,D.W., FLOTOW,H.E., FRIED,S.M. and MALM,J.G., 1974, heat capacity entropy and enthalpy of 242-puf3 from 10 to 350 degrees k., J. chem. phys., v. 4, pp. 1463-1468.

OSBORN,D.W., FLOTOW,H.E., FRIED,S.M. and MALM,J.G., 1975, heat capacity, entropy, enthalphy, and gibbs energy of 242-puf4 from 10 to 350 degrees k., J. chem. phys., v. 63 pp. 4613-4617.

OTTO,E.M., 1964, equilibrium pressures of oxygen over Mn2O3-Mn3O4 at various temperatures., electrochem. soc. jour., v. 111, pp. 88-92.

OUTHARD,J.C. and SHOMATE,H., 1942, heat of formation and high-temperature heat content of manganous oxide and manganous sulfate., jour. amer. chem. soc., v. 64, pp. 1770-1774.

OWENS,B.B. and MAYER.S.W. 1964, the thermodynamic properties of uranyl sulphate., J. inorg. nucl. chem., v. 26, pp. 501-507.

PANKRATZ,L.B. and KELLEY,K.K., 1964, high-temperature heat contents and entropies of akermanite, cordierite, gehienite and merwinite., u.s. bur. mines rept. inv. 6555, 5p.

PANKRATZ,L.B. and KING,E.G, 1970, high-temperature enthalpies and entropies of chalcopyrite and bornite., u.s. bur. mines rept. inv. 7435, 10p.

PANKRATZ,L.B. and KING,E.G., 1965, high-temperature heat contents and entropies of two zinc sulfides and four solid solutions of zinc and iron sulfides., u.s. bur. mines rept. inv. 6708, 8p.

PANKRATZ,L.B. and WELLER,W.W., 1967, thermodynamic properties of three lithium-aluminum silicates., u.s. bur. mines rept. inv. 7001, 13p.

PANKRATZ,L.B. and WELLER,W.W. 1969, thermodynamic data for ferric sulfate and indius sulfate., u.s. bur. mines rept. inv. 7280, p. 8.

PARKER,V.B., WAGMAN,D.D. and EVANS,W.H., 1971, selected values of chemical thermodynamic properties., u.s. natl. bur. standards tech. note 270-6., 106p.

PARKER,V.B., WAGMAN,D.D. and GARVIN,D. 1976, selected thermodynamic data compatible with the codata recommendations, u.s. natl. bur. standards, interim report compati 75-968, 34p.

PATIL,S.K. and RAMAKRISHNA,V.V., 1973a, study of the sulfate complexing of np(iv) and pu(iv) by solvent extraction with dinonyl naphthalene sulphonic acid., J. inorg. nucl. chem., v. 35, pp. 3333-3340.

PATIL,S.K. and RAMAKRISHNA,V.V. 1973b, studies on the sulfate complexing of tetravalent actinides., radiochim. acta., v. 19 pp. 27-30.

PATIL,S.K. and RAMAKRISHNA,V.V., 1976, sulphate and fluoride complexing of u(vi), np(vi), and pu(vi)., J. inorg. nucl. chem., v. 38, pp. 1075-1078.

PATIL,S.K., RAMAKRISHNA,V.V. and RAMANIAH,M.V., 1978, aqueous coordination complexes of neptunium., coor. chem. rev., v. 25, pp. 133-171.

PAULA., 1977, chemical durability of glasses- a thermodynamic approach, journal of materials science, v. 12, pp. 2246-2268.

PERRIN,D.D., 1964, the hydrolysis of metal ions. part 4. nickel., J. chem. soc., p. 3644-3648.

PETTINE,M., MILLERO,F.J. and MACCHI,G., 1981, hydrolysis of tin(ii) in aqueous solutions. anal. chem., v. 53, pp. 1039-1043.

PHILLIPS,S.L. 1982, hydrolysis and formation constants at 25 c., lawrence berkeley laboratory, lbl-14313., 65p

PITZER,K.S., 1937, the heats of ionization of water, ammonium hydroxide, carbonic, phosphoric and sulfuric acids. the variations in ionization with temperature and entropy change with ionization., J. amer. chem. soc., v. 59, pp. 2365-2371.

PLUMMER,L.N. and BUSENBERG,E., 1982, The solubilities of calcite, aragonite, and vaterite in C02-H20 solutions between 0 and 90 C and an evaluation of the aqueous model of the system CaCO3-CO2-H20., Geochimica et Cosmoshimica acta, v. 46, pp. 1011-1040.

PLUMMER,L.N., JONES,B.F. and TRUESDELL,A.H., 1976, wateqf - a fortran iv version of wateq, a computer program for calculating chemical equilibrium of natural waters., u.s. geol. surv. water resources investigations 76-13., 63p.

PO,H.N. and SUTIN,N. 1968, the stability constant of the monochloro complex of iron(ii). inorg. chem., v. 7 pp. 621-624.

POURBAIX,M., 1974, atlas of electrochemical equilibria in aqueous solutions nace, p. 485-492.

RAI,D. 1984, solubility product of pu(iv) hydrous oxide and equilibrium constants of pu(iv)/Pu(v), pu(iV)/Pu(vi), and pu(v)/pu(vi) couples., radiochimica acta, v. 35, pp. 97-106.

RAI,D. and RYAN,J.L., 1981, crystallinity and solubility of pu(iv) oxide and hydroxide in aged pacific northwest laboratory, (preprint)., 4 p. aqueous suspensions.

RAND,M.H. and KUBASCHEWSKI,O., 1963, the thermochemical properties of uranium of materials compounds., interscience publishers a division of John wiley and sons. inc., new york P. 65-68.

RAND,R.H. 1966 i. thermochemical properties., at. energy rev. 4, spec. issue, v. 1 pp. 7.

RARD,J.A. 1983, critical review of the chemistry and thermodynamics of technetium and some of its inorganic compounds and aqueous species., lawrence livermore national laboratory, ucrl-53440., 86p.

RARD,J.A. 1984, errata sheet to ucrl-53440., unpublished note, march 1984., 1p.

RARD,J.A. 1985a, chemistry and thermodynamics of ruthenium and some of its inorganic compounds and aqueous species., chemical reviews, v. 85, pp. 1-39.

RARD,J.A. 1985b, chemistry and thermodynamics of europium and some of its simpler inorganic compounds and aqueous species, chemical reviews, v. 85, pp. 555-582.

RARD,J.A., 1987a, thermodynamic data bases for multivalent elements: an example for ruthenium. presented at international conference of thermodynamics of aqueous systems with industrial applications., warrenton, virginia, may 10-14, 1987; ucrl-96555 rev. 1., 28p.

RARD,J.A., 1987b, update of the europium data base october 1987, lawrence livermore national laboratory internal memorandum.

REARDON,E.J., 1983, determination of srso4 ion pair formation using conductimetric and ion exchange techniques., geochim. cosmochim. acta, v. 47, pp. 1917-1922.

RICHARDSON,C.K. and HOLLAND,H.D., 1979, the solubility of fluorite in hydrothermal solutions, an experimental study., geochim. cosmochim. acta, v. 43 @ pp. 1313-1325.

RICHELMI,R. and LAFFITTE,M., 1967, analyse enthalpique differentielle de l'anhydride chromique par microcalorimetric., compt. rend., v. 265, pp. 541-543.

RICKARD,D., 1970, a note on the effect of ammonia on the solubility of some copper minerals., geologiska institutionen, stockholm university, p. 77-870.

RICKARD,D.T. and NRIAGU,J.O., 1978, aqueous environmental chemistry of lead. in the biochemistry of lead in the environment, ed. j.o.nriagu., elsevier, new york, p. 219-284.

ROBERTS,W.L., RAPP,JR.,G.R. and WEBER,J., 1974, encyclopedia of minerals, van nostrand reenhold company, ny.

ROBIE,R.A., 1965, heats and free energies of formation of trollite, herzenbergite, magnesite, and rhodochrosite calculated from equilibrium data., u.s. geol. survey prof. paper 525-d p. 65-72.

ROBIE,R.A., BETHKE,P.M. and BEARDSLEY,K.M., 1967, selected x-ray crystallographic data, molar volumes, and densities of minerals and related substances, u.s. geological survey bulletin 1248, 87p.

ROBIE,R.A., HEMINGWAY,B.S. and FISHER,J.R., 1979, thermodynamic properties of minerals and related substances at 298.15K and 1 bar (10**5 pascals) pressure and at higher temperatures, u.s. geological survey bulletin 1452, reprinted with corrections 1979 v. 1452, 1456p.

ROTH,W., WIRTHS,G. and BERENDT,H., 1940, zentralblatt fur mineralogie, geologie und palaontologie, zentr. mineral geol., v. 11, pp. 225-227.

RUAYA,J.R. and SEWARD,T.M. 1987, the ion-pair constant and other thermodynamic properties of hcl up to 350 c., geochim. cosmochim. acta, v. 51, pp. 121-130.

RYAN,J.L. and RAI,D., 1983, the solubility of uranium (iv) hydrous oxide in sodium hydroxide solutions and under reducing conditions., polyhedron, v. 2, pp. 947-952.

SARKAR,A.K., BARNES,NI.W. and ROY,D.M., 1982, longevity of borehole and shaft sealing materials: thermodynamic properties of cements and related phases applied to repository sealing, office of nuclear waste isolation technical report # onwi-201, 52p.

SCHAFER,V.H., TEBBEN,A. and GERHARDT,W., 1963, equilibria with ru, ruo2, ruo3(g), and ruo4(g)., z. anorg. allg. chem. in german, v. 321, pp. 41-550.

SCHEDIN,U., 1971, on the hydrolysis of plutonyl ion in sodium perchlorate medium., acta chem. scand., v. 25, pp. 747-749.

SCHEDIN,U., 1975, studies on the hydrolysis of metal ions. 62. the plutonyl ion in sodium perchlorate medium. acta. chem. scand., v. 29 pp. 333-344.

SCHINDLER,P., REINERT,M. and GAMSJAGER,H. 1963, zur thermodynamik der metallcarboriate. loslichkeitskonstanten and freie buldungsenthalpien von Cu2(OH)2CO3(malachit) undCu3(OH)2(CO3)2 (azulrt) bel 25 C, helv. chim. acta., v. 51, pp. 1845-1856.

SCHUILING,R., VERGOUWEN,L. and VAN DER RIJST,H. 1976, gibbs energies of formation, of zircon(zrsiO4), thorite(thsiO4) and phenacite(be2slO4). am. mineralogists, v. 61, pp. 161-168.

SCHWAB,A. and FELMY,A., 1982, review and reevaluation of pu thermodynamic data, draft manuscript, september, 1982., pacific northwest laboratories, pnl-sa-10731, never published 89P.

SERGEYEVA.E.I. and KHODAKOVSKIY,I.L. 1969, physicochemical conditions of formation of native arsenic in hydrothermal deposits. geokhimiva, v. 7, pp. 846-859.

SEWARD,T.M. 1974, determination of the first ionization constant of silicic acid from quartz solubility in borate buffer solutions to 350 deg c., geochim. cosmochim. acta, v. 38, pp. 1651-1664.

SEWARD,T.M. 1976, the stability of chloride complexes of silver in hydrothermal solutions up to 350c @eochim. cosmochim. acta, v. 40, pp. 1329-1341.

SEWARD,T.M., 1984, the formation of lead(ii) chloride complexes to 300c: a spectrophotometric study, geochim. cosmochim. acta, v. 48, pp. 121-134.

SHALINETS,A. and STEPANOV,A., 1972, investigation of complex formation of the trivalent actinide and lanthanide elements by the method of electromigration xvii. hydrolysis., radiokhimiya, v. 14, pp. 290-293.

SHCHIGOL,M., 1963, properties of lead borates, russ. jour. of inor. chem., v. 8, pp. 707-712.

SHEVCHENKO,V.B., TIMOSHEV,V.G. and VOLKOVA,A.A., 1959, stability constants of nitrate complexes of trivalent plutonium in aqueous and tributyl phosphate solutions. soviet j. at. energy., v. 6, pp. 293-296.

SHILOH,M., GIVON,M. and MARCUS,Y., 1969, a spectrophotometric study of the trivalent actinide complexes in solution - iii, americium with bromide, iodide, nitrate and carbonate ligands., jour, inorg, nucl, chem,. v. 31, pp. 1807-1814.

SHOMATE,C.H., 1944, high-temperature heat contents of magnesium nitrate, calcium nitrite and barium nitrate., am. chem. soc. jour, v. 66, pp. 928-929.

SHOMATE,C.H. and NAYLOR,B.F., 1945, high-temperature heat contents of aluminum oxide, aluminum sulfate, potassium sulfate, ammonium sulfate and ammonium bisulfate., am. chem. soc. jour., v. 67, pp. 72-75.

SILLEN,L.G. and MARTELL,A.E., 1964, stability constants of metal-ion complexes., the chemical society, spec. publ. no. 17, london.

SILLEN,L.G. and MARTELL,A.E., 1971, stability constants of metal-ion complexes, supplement no. 1., the chemical society, spec. publ. no. 25, london.

SILVA,R.J., 1982, the solubilities of crystalline neodymium and americium trihydroxides. lawrence berkeley laboratory report, lbl-15055, 57p.

SILVA,R.J. and NITSCHE,H., 1983, thermodynamic properties of chemical species of waste radionuclides., unpublished.

SILVA.R.J. and NITSCHE,H., 1985, carbonate complexation of pu(iv) in aqueous solution., amer. chemical soc. 189th national meeting, miami, april 28 - may 3., 1p

SMITH,R.M. and MARTELL,A.E., 1976, critical stability constants. vol. 4, inorganic complexes., plenum press, new york., v. 4, 257p.

SMYTH,J.R. and BISH,D.L., 1988, crystal structures and cation sites of the rock-forming minerals, allen & unwin, inc., boston.

SOMMER,L. and PLISKA,K., 1961, iron(iii) acetate complexes., coll. czech. chem. comm. v.26, pp. 2754-2773/

SOUTHARD,J.C. and MOORE,G.E., 1942, high temperature heat content of mn3o4, mnsio3 and mn3c., jour. amer. chem. soc., v. 64, pp. 1769-1770.

SPENCER,P.J. 1971, thermodynamic properties of alkali metal alloys., national physical laboratory division of chemical standards, p. 1-37.

SPENCER,P.J., 1973, the thermodynamic properties of silicates., national physical laboratory division of chemical standards p. 1-35.

STOHL,F.V. and SMITH,D.K., 1981, the crystal chemistry of the uranvi silicate minerals. american mineral., v. 66, pp. 610-624.

STRUNZ,H. and TENNYSON,C., 1981, symmetry and twinning in boltwoodite, soviet phys. cryst., v. 26(6), pp. 732-735.

STULL,D.R.,HILDENBRAN,L., OETTING,F.L. and SINKE,G.C., 1970, low themperature heat capacities of 15 inorganic compounds. chem. eng. data., v. 15, pp. 52-56.

SULLIVAN,J.C., WOODS,M., BERTRAND,P.A. and CHOPPIN,G.R., 1982, thermodynamics of plutonium (vi) interaction with bicarbonate., radiochimica acta, v. 31, pp. 45-50.

SVERJENSKY,D.A., 1984, prediction of gibbs free energies of calcite type carbonates and the equilibrium distribution of trace elements between carbonates and aqueous solutions., geochim. cosmochim. acta., v. 48, pp. 1127-1134.

SWEETON,F.H. and BAES,C.F.,JR., 1970, the solubility of magnetite and hydrolysis of ferrous ion in aqueous solutions at elevated temperatures., j. chem. thermodyn., v. 2, pp. 479-500.

SYKES,K.W., 1952, the reaction between ferric and iodide ions. part ii. the influence of ionic association. chem., soc., v. 1952, pp. 124-129.

SYLVA,R.N. and DAVIDSON,M.R. , 1979, the hydrolysis of metal ions. part 2. dioxouranium(vi). chem. soc., dalton trans., p. 465-471.

TASKER,I.R., O'HARE,P.A.G., LEWIS,B.M., JOHNSON,G.K. and CORDFUNKE,E.H.P., 1987, thermochemistry of uranium compounds. xvi. calorimetric determination of the standard molar enthalpy of formation at 298.15 k, low temperature heat capacity, and high-temperature enthalpy increments of uo2(oh)2.h2o (schoepite). , lawrence livermore national laboratory, ucrl-21055, 17p.

TAYLOR,A.R.,JR. and SMITH,D.F., 1962, thermodynamic properties of strontium bromide and strontium nitrate., u.s. bur. mines dept. inv. 5967, 12p.

TERPILOWSKI,J. and RATAJCZAK,E., 1967, wiasnosci thermodynamiczne selenku cynku., roczn. chem., v. 41, pp. 429-432.

TORGESON,D. and SHOMATE,C., 1969, heats of formation of 3CaO.B203, 2CaO.B203, CaO.B203 and CaO.B203., j. amer. chem. soc., v. 69, pp. 2103-2105.

TREMAINE,P.R. and LEBLANC,J.C., 1980, the solubility of magnetite and the hydrolysis and oxidation of fe++ in water to 300 c., J. solution chem., v. 9, pp. 415-442.

TREMAINE,P.R., CHEN,J.D., WALLACE,G.J. and BOIVIN,W.A., 1981, solubility of uranium(iv) oxide in alkaline aqueous solutions to 300c., J. soln. chem., v. 10, pp. 221-230.

TRIPATHI,V.S., 1984, uranium (vi) transport modeling: geochemical data and submodels, stanford university, (unpublished ph.d. dissertation)., 297p.

TRUESDELL,A.H. and JONES,B.F., 1974, wateq, a computer program for calculating chemical equilbria of natural waters., u.s. geol. surv. jour. res., v. 2, pp. 233-248.

TUMMAVUORI,J., 1971, spectrophotometric determination of the stability constants of complexes formed by copper(ii) and nitrite ions in sodium perchlorate solutions at 25 c., suomen kem., v. 44, pp. 222-228.

TURNBULL,A., 1961, thermochemistry of zirconium halides. phys.chem., v. 65 pp. 1652-1961

TURNBULL,A.G., 1973, a thermochemical study of vaterite. geochim. et cosmochim. acta v. 37, pp. 1593-1601.

TURNER,D.R., WHITFIELD,M. and DICKSON,A.G., 1981, the equilibrium speciation of dissolved components in freshwater and seawater at 25 c and 1 atm pressure., geochim. cosmochim. acta, v. 45 , pp. 855-881.

URKOV,K.A., LILIC,L.S. and SILLEN,L.G., 1965, the nickel ion, ni+2, in 3m (na)clo4 medium., acta. chem. scand., v. 19, pp. 14-29.

VASUDEVA RAO,P.R., BAGAWDE,S.V., RAMAKRISHNA,V.V. and PATIL,S.K., 1978, sulfate complexing of some trivalent actinides., J. inorg. nucl. chem., v. 40, pp. 123-127.

VAUGHAN,D.J. and CRAIG,J.R., 1978, mineral chemistry of metal sulfides., cambridge university press, mass.

VICTOR,A.C. and DOUGLAS,T.B., 1961, thermodynamic properties of thorium dioxide from 298 to 1200 k., u.s. natl. bur. standards jour. research, v. 65a, pp. 105-111.

VICTOR,A.C. and DOUGLAS,T.B., 1963, thermodynamic properties of magnesium oxide and beryllium oxide from 298 to 1200 k., u.s. natl. bur standards jour. research v. 67a, pp. 325-329.

VOLKOV,A.I., YAGLOV,V.N. and NOVIKOV,G.I., 1975, heats of formation of cobalt and nickel orthophosphates octahydrides., vesti. akad. navuk. b. sssr. ser. khlm. navuk., p. 124-125.

VORONON,G.F. 1970, estimation of standard entropies of chemical compounds., zhur. fiz. khim., v. 44 pp. 1717-1719.

WAGMAN,D., PARKER,W. and SCHUMM.R., 1976, chemical thermodynamic properties of compounds of sodium, potassium and rubidium., u.s. natl. bur. stand., v. 76.

WAGMAN,D.D, EVANS,W.H., PARKER,V.B. and SCHUMM,R.H., 1976, chemical thermodynamic properties of compounds of sodium, potassium and rubidium-an interim tabulation of selected values., u.s. natl. bur. standards interim rep. 76-1034.

WAGMAN,D.D., EVANS,W.H., PARKER,V.B., HALOW,I., BAILEY,S.M. and SCHUMM,R.H., 1969, selected values of chemical thermodynamic properties, tables for elements 35 through 53, u.s. natl. bur. standards tech. note 270-4., 152p.

WAGMAN,D.D., EVANS,W.H., PARKER,V.B., HALOW,I., BAILEY,S.M. and SHUMM,R.H., 1968, selected values of chemical thermodynamic properties., u.s. nati-bur. standards tech. note 270-3., 264p.

WAGMAN,D.D., EVANS,W.H., PARKER,V.B., HALOW,I., BAILEY,S.M., SCHUMM,R.H. and CHURNEY.K.L., 1971, selected values of chemical thermodynamic properties., u.s. natl. bur. standards tech. note 270-5., p. 12-21.

WAGMAN,D.D., EVANS,W.H., PARKER,V.B., SCHUMM,R.H. and NUTTALL,R., 1981, selected values of chemical thermodynamic properties. compounds of uranium, protactinium, thorium, actinium, and the alkali metals., u.s. natl. bur. standards tech. note 270-8., 134p.

WAGMAN,D.D., EVANS,W.H., PARKER,V.B., SCHUMM,R.H., HALOW,I., BAILEY,S.M., CHURNEY,K.L. and NUTTALL,R.L. 1982, the nbs tables of chemical thermodynamic properties, selected values for inorganic and c1 and c2 organic substances in si units., j. phys. chem. reference data, vol 11, supplement 2, 392p.

WAGMAN,D.D., SCHUMM,R.H. and PARKER,V.B. 1977, a computer assisted evaluation of the thermochemical data of compounds of thorium., u.s. natl. bur. standards interim report, nbsir 77-1300., p. 93.

WALSH,P.N., ART,E.W. and WHITELD., 1962, the heat capacity of the silver chalcogenides. Ag1.99S, Ag1.99Se, and Ag1.88Te from 16 to 300 k., j. phys. chem., v. 66, pp. 1546-1549.

WARD,M. and WELCH,G., 1956, the chloride complexes of trivalent plutonium, americium, and curium., jour. inorg. nucl. chem., v. 2, pp. 95-402.

WEAST,R.C.(ED.), 1990, crc handbook of chemistry and physics, crc press, inc., boca raton, fl., 70th ed.

WELLER,W.W. and KELLEY,K.K., 1964, low-temperature heat capacities and entropies at 298.15 k of sulfides of arsenic, germanium and nickel., u.s. bur. mines rept. inv. 6511, 7p.

WELLS,C.F., 1969, reaction of Feaq2+ and FeClaq+ with hydrogen peroxide in perchlorate media at 25 k., j. chem. soc. a, p. 2741-2743.

WILDERVANCK,J.C. and JELLINEK,F., 1971, the dichalcogenides of technetium and rhenium journal of less-common metals, v. 24, pp. 73-81.

WILLIX,R.L.S., 1963, ferrous-ferric redox reaction in the presence of sulphate ion., J. chem. soc. trans. faraday soc., v. 59, pp. 1315-1324.

WOLERY,T.J., 1978, some chemical aspects of hydrothermal processes at mid-oceanic ridges a theoretical study. 1. basalt-sea water reaction and chemical cycling between the oceanic crust and the oceans. ii. calculation of chemical equilibrium between aqueous solutions and minerals, northwestern universlty, evaston, illinois (unpublished ph.d. dissertation), 263p.

WOLERY,T.J., 1985, notes, private written communication, 23P.

WOODS,T.L. and GARRELS,R.M., 1987, thermodynamic values at low temperature for natural inorganic materials: an uncritical summary, oxford university press.

ZOTOV,A.V. and KOTOVA,Z.Y., 1979, spectroscopic determination of the first hydrolysis constant of fe+++ in the interval 80-200 c., geokhimiya, v. 5, pp. 768-773.

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.)

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To be completed by GENISES Database Personnel

RECEIVED BY: _____ DATE: _____
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VERIFIED BY: _____ DATE: _____
APPROVED BY: _____ DATE: _____

PRODUCT OR ACCESSION NUMBERS: _____

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

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

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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.ATNUM
- 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

2nd Quarter, 1992

Appendix C: GEMBOCHS Audit Table: Second Quarter, 1992

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
*****	*****	*** *****	*** *****	****
Species: (UO2)2(CO3)(OH)3-				
reactio	coeff	-3.000 H+	-4.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92
Comments: new aux set				
Species: (UO2)3(PO4)2				
reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				
Species: (UO2)3(PO4)2:4H2O				
reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				
Species: Acetone(aq)				
reactio	coeff	-4.000 O2(g)	-1.000 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	3.000 H+	1.500 Acetic a	4/14/92
Comments: new aux set				
Species: Ag3PO4				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			
basic	logk	500.000	-17.550	4/21/92
Comments:	rewrote reaction			
tpgrid	logk	25.000 -17.550	25.000 500.000	4/21/92
Comments:	rewrote reactions			

****

Species: Al3(OH)4(5+)

reactio	coeff	0.000	-4.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/15/92
Comments:	new aux set			
tpgrid	logk	25.000 42.100	25.000 500.000	4/15/92
Comments:	rewrote reactions			

****

Species: Am(CO3)2-

reactio	coeff	0.000	-2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -13.300	25.000 500.000	4/14/92
Comments:	reaction rewritten			

****

Species: Am(CO3)3---

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -14.950	25.000 500.000	4/14/92
Comments:	reaction rewritten			

****

Species: Am(OH)2+

reactio	coeff	0.000	-2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -12.000	25.000 500.000	4/14/92
Comments:	rewrote reaction			

****

Species: Am(OH)3

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 26.600	25.000 500.000	4/14/92
Comments:	rewrote reaction			

****

Species: Am(OH)3(am)

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 25.100	25.000 500.000	4/14/92
Comments:	rewrote reaction			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Am(OH)3(aq)

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/15/92
Comments:	new aux set			
tpgrid	logk	25.000 -18.200	25.000 500.000	4/15/92
Comments:	rewrote reaction			

****

Species: AmCO3+

reactio	coeff	0.000	-1.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -8.260	25.000 500.000	4/14/92
Comments:	rewrote reaction			

****

Species: AmOH++

reactio	coeff	0.000	-1.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	1.000 OH-	1.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 -7.410	25.000 500.000	4/17/92
Comments:	rewrote reaction			

****

Species: AmOHCO3

reactio	coeff	1.000 OH-	-2.000 H+	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	0.000	1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92
Comments: new aux set				
tpgrid	logk	25.000 22.600	25.000 500.000	4/14/92
Comments: rewrote reaction				

****

Species: B2O(OH)5-

reactio	coeff	-1.000 H2O	-1.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	1.000 OH-	2.000 B(OH)3(a	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -4.690	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-4.690	4/17/92
Comments: rewrote reactions				

****

Species: B3O3(OH)4-

reactio	coeff	1.000 OH-	-1.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	-3.000 H2O	-2.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -6.690	25.000 500.000	4/17/92
Comments: rewrote reactions				
basic	logk	500.000	-6.690	4/17/92
Comments: rewrote reactions				

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: B4O5(OH)4--				
reactio	coeff	2.000 OH-	-2.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	-5.000 H2O	-3.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -12.940	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-12.940	4/17/92
Comments: rewrote reactions				
**********				
Species: Benzene(aq)				
reactio	coeff	-7.500 O2(g)	-1.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	6.000 H+	3.000 Acetic a	4/14/92
Comments: new aux set				
**********				
Species: CaOH+				
tpgrid	logk	0.000 0.000	25.000 -12.850	4/17/92
Comments: didn't rewrite reaction				
tpgrid	logk	25.000 -12.850	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-12.850	4/17/92
Comments: rewrote reactions				
**********				
Species: CaPO4-				
reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
tpgrid	logk	25.000 6.460	25.000 500.000	4/21/92
Comments: rewrote reaction				
basic	logk	500.000	6.460	4/21/92
Comments: rewrote reaction				

****

Species: Co(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 9.700	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	9.700	4/17/92
Comments: rewrote reaction				

****

Species: Co(OH)4--

reactio	coeff	0.000	-4.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 10.200	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	10.200	4/17/92
Comments: rewrote reaction				

****

Species: Co4(OH)4++++

reactio	coeff	0.000	-4.000 H+	4/17/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 25.600	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	25.600	4/17/92
Comments: rewrote reaction				

****

Species: Cu3(PO4)2:3H2O

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux sset				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux sset				
tpgrid	logk	25.000 -35.120	25.000 500.000	4/21/92
Comments: rewrote reaction				
basic	logk	500.000	-35.120	4/21/92
Comments: rewrote reactions				

****

Species: CuPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.400	25.000 500.000	4/21/92
Comments: rewrote reaction				
basic	logk	500.000	6.400	4/21/92
Comments: rewrote reaction				

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: Ethane(aq)				
reactio	coeff	-3.500 O2(g)	-1.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	2.000 H+	1.000 Acetic a	4/14/92
Comments: new aux set				

****

Species: Eu(CO3)3---				
reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: Eu(OH)(CO3)2--				
species	name	Eu(OH)(CO3)2--	EuOH(CO3)2--	4/15/92
Comments: written with standard naming conventions				

****

Species: Eu(OH)2CO3-				
reactio	coeff	-2.000 H+	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: Eu(OH)CO3(aq)				
species	name	Eu(OH)CO3(aq)	EuOHCO3(aq)	4/15/92
Comments: standard naming conventions				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Eu2(CO3)3:3H2O

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: EuCO3+

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: EuOH(CO3)2--

reactio	coeff	-1.000 H+	-3.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: EuOHCO3(aq)

reactio	coeff	-1.000 H+	-2.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: FeCO3(aq)

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			
tpgrid	logk	25.000 4.730	25.000 500.000	4/15/92
Comments:	rewrite reaction			
basic	logk	500.000	4.730	4/15/92
Comments:	rewrite reaction			

****

Species: FeCO3+

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			
tpgrid	logk	25.000 9.720	25.000 500.000	4/15/92
Comments:	rewrite reaction			
basic	logk	500.000	9.720	4/15/92
Comments:	rewrite reactions			

****

Species: FePO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 7.930	25.000 500.000	4/21/92
Comments:	rewrote reactions			
basic	logk	500.000	7.930	4/21/92
Comments:	rewrote reactions			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Glycine(aq)

reactio	coeff	-3.500 O2(g)	-1.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 NO3-	-1.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	0.000	0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 HCO3-	1.000 Acetic a	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 H+	1.000 NH4+	4/14/92
Comments:	new aux set			

****

Species: Hinsdalite

reactio	coeff	-6.000 H+	-7.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 -2.500	25.000 500.000	4/21/92
Comments:	rewrote reactions			
basic	logk	500.000	-2.500	4/21/92
Comments:	rewrote reactions			

****

Species: Hopeite

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
tpgrid	logk	25.000 -35.300	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	-35.300	4/21/92
Comments: rewrote reactions				

****

Species: Ice

reactio	coeff	1.000 H+	1.000 H2O	4/17/92
Comments: new aux set				

****

Species: Methanamine(aq)

reactio	coeff	-3.500 O2(g)	-0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	1.000 H2O	-1.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	1.000 HCO3-	0.500 Acetic a	4/14/92
Comments: new aux set				
reactio	coeff	1.000 NO3-	1.000 NH4+	4/14/92
Comments: new aux set				

****

Species: Methanol(aq)

reactio	coeff	-1.500 O2(g)	-0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	1.000 H+	0.500 Acetic a	4/14/92
Comments: new aux set				

****

Species: Mg2CO3++

reactio	coeff	0.000	-1.000 H+	4/15/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: MgPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.589	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	6.589	4/21/92
Comments: rewrote reactions				

****

Species: Mn3(PO4)2

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 -23.827	25.000 500.000	4/21/92
Comments: rewrite reactions				
basic	logk	500.000	-23.827	4/21/92
Comments: rewrite reactions				

****

Species: MnCO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
tpgrid	logk	25.000 4.520	25.000 500.000	4/15/92
Comments: rewrite reaction				
basic	logk	500.000	4.520	4/15/92
Comments: rewrote reaction				

****

Species: MnPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.180	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	6.180	4/21/92
Comments: rewrote reactions				

****

Species: NaCO3-

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: NaNpO2CO3:3.5H2O

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: NaOH(aq)

basic	logk	-14.180	-0.180	6/ 2/92
Comments: correct logk for ref. reaction				

****

Species: Ni(OH)2(aq)

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 8.000	25.000 500.000	4/17/92
Comments: rewrote reaction				

****

Species: Ni(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 11.000	25.000 500.000	4/17/92
Comments: rewrote reaction				

****

Species: Ni4(OH)4++++

reactio	coeff	0.000	-4.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 28.300	25.000 500.000	4/17/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: rewrote reaction				
basic	logk	0.000	28.300	4/17/92
Comments: rewrote reaction				

****

Species: NiCO3

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: Np(CO3)5(6-)

reactio	coeff	0.000	-5.000 H+	4/15/92
Comments:				
reactio	coeff	5.000 CO3--	5.000 HCO3-	4/15/92
Comments:				
basic	logk	500.000	38.300	4/15/92
Comments: rewrote reaction				

****

Species: NpO2(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	14.000	4/15/92
Comments: rewrote reaction				

****

Species: NpO2(CO3)2---

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	7.000	4/15/92
Comments: rewrote reaction				

****

Species: NpO2(CO3)3(5-)

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	8.500	4/15/92
Comments: rewrote reactions				

****

Species: NpO2(CO3)3----

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	20.400	4/15/92
Comments: rewrote reaction				

****

Species: NpO2CO3-

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
basic	logk	500.000	4.600	4/15/92

Comments: rewrote reaction

****

Species: OH-

species	type	aux	aqueous	6/26/92

Comments: rewrite aux/aqueous set

****

Species: Pb(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92

Comments: new aux set

reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92

Comments: new aux set

****

Species: Pb(OH)2(aq)

reactio	coeff	0.000	-2.000 H+	4/17/92

Comments: new aux set

reactio	coeff	2.000 OH-	2.000 H2O	4/17/92

Comments: new aux set

****

Species: Pb(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92

Comments: new aux set

reactio	coeff	3.000 OH-	3.000 H2O	4/17/92

Comments: new aux set

****

Species: PbCO3(aq)

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: Plumbogummite

reactio	coeff	-5.000 H+	-7.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 -32.790	25.000 500.000	4/21/92
Comments:	rewrite reactions			
basic	logk	500.000	-32.790	4/21/92
Comments:	rewrite reactions			

****

Species: Pu(OH)2.5Cl0.5

reactio	coeff	0.000	-2.500 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.500 OH-	2.500 H2O	4/17/92
Comments:	new aux set			

****

Species: Pu(OH)4CO3--

reactio	coeff	0.000	-5.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/15/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: PuCO3++

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			
tpgrid	logk	25.000 -15.300	25.000 500.000	4/15/92
Comments:	rewrote reactions			

****

Species: PuO2(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: PuO2(CO3)3----

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: PuO2(OH)2HCO3-

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Pyromorphite

reactio	coeff	0.000	-3.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	3.000 PO4---	3.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: S2O4--

reactio	coeff	-1.500 O2(g)	-1.000 S2O4--	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 S2O4--	0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 H2O	1.000 S2O3--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S2O5--

reactio	coeff	-1.000 H2O	-1.000 S2O5--	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 S2O5--	1.000 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 O2(g)	1.000 S2O3--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: S2O6--				
reactio	coeff	-1.000 H2O	-1.000 S2O6--	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S2O6--	1.000 S2O3--	4/14/92
Comments: new aux set				
reactio	coeff	-0.500 O2(g)	1.500 O2(g)	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S2O8--				
reactio	coeff	-1.000 H2O	-1.000 S2O8--	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S2O8--	1.000 S2O3--	4/14/92
Comments: new aux set				
reactio	coeff	0.500 O2(g)	2.500 O2(g)	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S3--				
reactio	coeff	-2.000 H2O	-1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 O2(g)	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	3.000 HS-	1.000 HS-	4/14/92
Comments: new aux set				
reactio	coeff	0.000	1.000 S2--	4/14/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S3O6--

reactio	coeff	-2.000 O2(g)	-0.500 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	-2.000 H2O	-1.000 S3O6--	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 SO4--	1.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	4.000 H+	1.000 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 S3O6--	1.500 S2O3--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S4--

reactio	coeff	-3.000 H2O	-1.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	1.500 O2(g)	0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	4.000 HS-	2.000 S2--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S4O6--

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	-3.000 H2O	-1.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	-3.500 O2(g)	-1.000 S4O6--	4/14/92
Comments:	new aux set			
reactio	coeff	6.000 H+	0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	4.000 SO4--	2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 S4O6--	2.000 S2O3--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S5--

reactio	coeff	-4.000 H2O	-2.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	5.000 HS-	1.000 HS-	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 O2(g)	1.000 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	0.000	2.000 S2--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S5O6--

reactio	coeff	-5.000 O2(g)	-0.500 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	-4.000 H2O	-1.000 S5O6--	4/14/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	8.000 H+	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	5.000 SO4--	1.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S5O6--	1.500 S2O3--	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: SCN-

reactio	coeff	3.000 H+	-1.000 SCN-	4/14/92
Comments: new aux set				
reactio	coeff	1.000 SO4--	-3.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 NO3-	1.000 HCO3-	4/14/92
Comments: new aux set				
reactio	coeff	1.000 HCO3-	1.000 HS-	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 SCN-	1.000 NH4+	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: ScN-

species	name	ScN-	SCN-	4/14/92
Comments: capitalized incorrectly				

****

Species: Sn(OH)2(aq)

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-20.080	4/17/92
Comments:	rewrote reactions			

****

Species: Sn(OH)2++

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-27.800	4/17/92
Comments:	rewrote reaction			

****

Species: Sn(OH)3+

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-42.500	4/17/92
Comments:	rewrote reactions			

****

Species: Sn(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
basic	logk	500.000	-24.580	4/17/92
Comments: new aux set				

****

Species: Sn(OH)4(aq)

reactio	coeff	0.000	-4.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	4.000 OH-	4.000 H2O	4/21/92
Comments: new aux set				
basic	logk	500.000	-56.830	4/21/92
Comments: rewrote reaction				

****

Species: SnOH+

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 OH-	1.000 H2O	4/21/92
Comments: new aux set				
basic	logk	500.000	-10.010	4/21/92
Comments: rewrote reaction				

****

Species: SnOH+++

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 OH-	1.000 H2O	4/21/92
Comments: new aux set				
basic	logk	500.000	-14.600	4/21/92
Comments: rewrote reaction				

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: SrPO4- .				
reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 5.480	25.000 500.000	4/21/92
Comments: rewrite reaction				
basic	logk	500.000	5.480	4/21/92
Comments: rewrite reactions				

****

Species: Tsumebite				
reactio	coeff	-3.000 H+	-4.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 -9.790	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	-9.790	4/21/92
Comments: rewrote reactions				

****

Species: U(CO3)2				
reactio	coeff	0.000	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: U(CO3)4----				
reactio	coeff	0.000	-4.000 H+	4/15/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	4.000 CO3--	4.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: U(SCN)2++

reactio	coeff	8.000 H+	-1.000 U(SCN)2	4/14/92
Comments: new aux set				
reactio	coeff	2.000 SO4--	1.000 U++++	4/14/92
Comments: new aux set				
reactio	coeff	2.000 NO3-	2.000 SCN-	4/14/92
Comments: new aux set				

****

Species: U(ScN)2++

species	name	U(ScN)2++	U(SCN)2++	4/14/92
Comments: capitalized wrong				

****

Species: U3P4

reactio	coeff	0.000	-4.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	4.000 PO4---	4.000 HPO4--	4/21/92
Comments: new aux set				

****

Species: UO2(H2PO4)2(aq)

reactio	coeff	4.000 H+	2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: UO2(H2PO4)H3PO4+

reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			
reactio	coeff	5.000 H+	3.000 H+	4/21/92
Comments:	new aux set			

****

Species: UO2(SCN)2(aq)

reactio	coeff	6.000 H+	-1.000 UO2(SCN	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 SO4--	1.000 UO2++	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 NO3-	2.000 SCN-	4/14/92
Comments:	new aux set			

****

Species: UO2(SCN)3-

reactio	coeff	9.000 H+	-1.000 UO2(SCN	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 SO4--	1.000 UO2++	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 NO3-	3.000 SCN-	4/14/92
Comments:	new aux set			

****

Species: UO2(ScN)2(aq)

species	name	UO2(ScN)2(aq)	UO2(SCN)2(aq)	4/14/92
Comments:	capitalized wrong			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: UO2(ScN)3-

species	name	UO2(ScN)3-	UO2(SCN)3-	4/14/92
Comments:	name capitalized incorrectly			

****

Species: UO2.25

cp6	t_2	0.000	-1.786e+007	6/ 9/92
Comments:	data in 90nea			
cp6	t1	0.000	-6.974	6/ 9/92
Comments:	data in 90nea			
cp6	limit	298.150	0.000	6/ 9/92
Comments:	data in 90nea			
cp6	t2	0.000	0.010	6/ 9/92
Comments:	data in 90nea			
cp6	t0	0.000	1487.600	6/ 9/92
Comments:	data in 90nea			

****

Species: UO2CO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: UO2H2PO4+

reactio	coeff	2.000 H+	1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

```
  TABLE     COLUMN    OLD VALUE        NEW VALUE        DATE
  =====     ======    === =====        === =====        ====

  Comments:  new aux set

*****************************************************************

Species:  UO2H3PO4++

  reactio  coeff    1.000 PO4---     1.000 HPO4--      4/21/92
  Comments:  new aux set

  reactio  coeff    3.000 H+         2.000 H+          4/21/92
  Comments:  new aux set

*****************************************************************

Species:  UO2HPO4

  reactio  coeff    1.000 H+         1.000 HPO4--      4/21/92
  Comments:  new aux set

  reactio  coeff    1.000 PO4---     1.000 UO2++       4/21/92
  Comments:  new aux set

  tpgrid   logk     25.000 -25.000   25.000 500.000    4/21/92
  Comments:  rewrite reaction

  basic    logk     500.000          -25.000           4/21/92
  Comments:  rewrite reaction

*****************************************************************

Species:  UO2HPO4:4H2O

  reactio  coeff    1.000 H+         1.000 HPO4--      4/21/92
  Comments:  new aux set

  reactio  coeff    1.000 PO4---     1.000 UO2++       4/21/92
  Comments:  new aux set

  reactio  coeff    1.000 UO2++      4.000 H2O         4/21/92
  Comments:  new aux set

*****************************************************************

Species:  UO2PO4-
```

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				

****

Species: UO2SCN+

reactio	coeff	3.000 H+	-1.000 UO2SCN+	4/14/92
Comments: new aux set				
reactio	coeff	1.000 SO4--	1.000 SCN-	4/14/92
Comments: new aux set				

****

Species: UO2ScN+

species	name	UO2ScN+	UO2SCN+	4/14/92
Comments: name capitalized incorrectly				

****

Species: UO3(beta)

cp6	limit	298.150	0.000	6/ 9/92
Comments: data in 90nea				

****

Species: UO3(epsil)

cp6	t_2	0.000	-1.013e+006	6/10/92
Comments: data in 90nea				
cp6	t1	0.000	0.017	6/10/92
Comments: data in 90nea				
cp6	limit	0.000	850.000	6/10/92
Comments: data in 90nea				
cp6	t0	0.000	88.103	6/10/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: data in 90nea

****

Species: UP

reactio	coeff	2.000 H+	1.000 H+	4/21/92

Comments: new aux set

reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

Comments: new aux set

****

Species: UP2

reactio	coeff	4.000 H+	2.000 H+	4/21/92

Comments: new aux set

reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92

Comments: new aux set

****

Species: UP2O7

reactio	coeff	4.000 H+	2.000 H+	4/21/92

Comments: new aux set

reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92

Comments: new aux set

****

Species: UPO5

reactio	coeff	2.000 H+	1.000 H+	4/21/92

Comments: new aux set

reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

Comments: new aux set

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: USCN+++

reactio	coeff	5.000 H+	-1.000 USCN+++	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 SO4--	1.000 SCN-	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 UO2++	1.000 U++++	4/14/92
Comments:	new aux set			

****

Species: UScN+++

species	name	UScN+++	USCN+++	4/14/92
Comments:	capitalized incorrectly			

****

Species: Vivianite

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: ZnPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 6.350	25.000 500.000	4/21/92
Comments:	rewrite reaction			
basic	logk	500.000	6.350	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: rewrite reactions

Appendix D

GEMBOCHS AUDIT TABLE

DOOUT Suites R13 to R16

GEMBOCHS-D2

Appendix D1: GEMBOCHS Audit Table: DATA0 Suite R13 to R14

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)2(CO3)(OH)3-

reactio	coeff	-3.000 H+	-4.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92
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+

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
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
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: (UO2)3(PO4)2

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				

****

Species: (UO2)3(PO4)2:4H2O

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				

****

Species: Acetone(aq)

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	-4.000 O2(g)	-1.000 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 H+	1.500 Acetic a	4/14/92
Comments:	new 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: Ag3PO4

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			
basic	logk	500.000	-17.550	4/21/92
Comments:	rewrote reaction			
tpgrid	logk	25.000 -17.550	25.000 500.000	4/21/92
Comments:	rewrote reactions			

****

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			

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
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++++				
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: Al3(OH)4(5+)				
reactio	coeff	0.000	-4.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	4.000 OH-	4.000 H2O	4/15/92
Comments: new aux set				
tpgrid	logk	25.000 42.100	25.000 500.000	4/15/92
Comments: rewrote reactions				

****

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: Am(CO3)2-

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	0.000	-2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -13.300	25.000 500.000	4/14/92
Comments:	reaction rewritten			

****

Species: Am(CO3)3---

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -14.950	25.000 500.000	4/14/92
Comments:	reaction rewritten			

****

Species: Am(OH)2+

reactio	coeff	0.000	-2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/14/92
Comments:	new aux set			
tpgrid	logk	25.000 -12.000	25.000 500.000	4/14/92
Comments:	rewrote reaction			

****

Species: Am(OH)3

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/14/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
tpgrid	logk	25.000 26.600	25.000 500.000	4/14/92
Comments: rewrote reaction				

****

Species: Am(OH)3(am)

reactio	coeff	0.000	-3.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	4/14/92
Comments: new aux set				
tpgrid	logk	25.000 25.100	25.000 500.000	4/14/92
Comments: rewrote reaction				

****

Species: Am(OH)3(aq)

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 OH-	3.000 H2O	4/15/92
Comments: new aux set				
tpgrid	logk	25.000 -18.200	25.000 500.000	4/15/92
Comments: rewrote reaction				

****

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: AmCO3+

reactio	coeff	0.000	-1.000 H+	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92
Comments: new aux set				
tpgrid	logk	25.000 -8.260	25.000 500.000	4/14/92
Comments: rewrote reaction				

****

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: AmOH++

reactio	coeff	0.000	-1.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	1.000 OH-	1.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -7.410	25.000 500.000	4/17/92
Comments: rewrote reaction				

****

Species: AmOHCO3

reactio	coeff	1.000 OH-	-2.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	0.000	1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
tpgrid	logk	25.000 22.600	25.000 500.000	4/14/92
Comments: rewrote reaction				

****

Species: B2O(OH)5-

reactio	coeff	-1.000 H2O	-1.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	1.000 OH-	2.000 B(OH)3(a	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -4.690	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-4.690	4/17/92
Comments: rewrote reactions				

****

Species: B3O3(OH)4-

reactio	coeff	1.000 OH-	-1.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	-3.000 H2O	-2.000 H2O	4/17/92
Comments: new aux set				
tpgrid	logk	25.000 -6.690	25.000 500.000	4/17/92
Comments: rewrote reactions				
basic	logk	500.000	-6.690	4/17/92
Comments: rewrote reactions				

****

Species: B4O5(OH)4--

reactio	coeff	2.000 OH-	-2.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	-5.000 H2O	-3.000 H2O	4/17/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
tpgrid	logk	25.000 -12.940	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-12.940	4/17/92
Comments: rewrote reactions				

****

Species: BF4-

species	type	aqueous	aux	3/27/92
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: Benzene(aq)

reactio	coeff	-7.500 O2(g)	-1.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	6.000 H+	3.000 Acetic a	4/14/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

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

****

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

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
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)

species	type	aux	aqueous	3/26/92
Comments: rewrite of aux set				

****

Species: CO3--

species	type	aux	aqueous	3/26/92
Comments: new aux species set				

****

Species: CaOH+

tpgrid	logk	0.000 0.000	25.000 -12.850	4/17/92
Comments: didn't rewrite reaction				
tpgrid	logk	25.000 -12.850	25.000 500.000	4/17/92
Comments: rewrote reaction				
basic	logk	500.000	-12.850	4/17/92
Comments: rewrote reactions				

****

Species: CaPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: new aux set

tpgrid	logk	25.000 6.460	25.000 500.000	4/21/92

Comments: rewrote reaction

basic	logk	500.000	6.460	4/21/92

Comments: rewrote reaction

****

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: Co(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92

Comments: new aux set

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 9.700	25.000 500.000	4/17/92
Comments:	rewrote reaction			
basic	logk	500.000	9.700	4/17/92
Comments:	rewrote reaction			

****

Species: Co(OH)4--

reactio	coeff	0.000	-4.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 10.200	25.000 500.000	4/17/92
Comments:	rewrote reaction			
basic	logk	500.000	10.200	4/17/92
Comments:	rewrote reaction			

****

Species: Co4(OH)4++++

reactio	coeff	0.000	-4.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 25.600	25.000 500.000	4/17/92
Comments:	rewrote reaction			
basic	logk	500.000	25.600	4/17/92
Comments:	rewrote reaction			

****

Species: Cu(CO3)2--

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
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: Cu3(PO4)2:3H2O

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux sset				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux sset				
tpgrid	logk	25.000 -35.120	25.000 500.000	4/21/92
Comments: rewrote reaction				
basic	logk	500.000	-35.120	4/21/92
Comments: rewrote reactions				

****

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				

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Species: CuPO4-				
reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.400	25.000 500.000	4/21/92
Comments: rewrote reaction				
basic	logk	500.000	6.400	4/21/92
Comments: rewrote reaction				

****

Species: Ethane(aq)				
reactio	coeff	-3.500 O2(g)	-1.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	2.000 H+	1.000 Acetic a	4/14/92
Comments: new aux 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: Eu(CO3)3---				
reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Eu(OH)(CO3)2--

species name Eu(OH)(CO3)2-- EuOH(CO3)2-- 4/15/92
Comments: written with standard naming conventions

****

Species: Eu(OH)2CO3-

reactio coeff -2.000 H+ -3.000 H+ 4/15/92
Comments: new aux set

reactio coeff 1.000 CO3-- 1.000 HCO3- 4/15/92
Comments: new aux set

****

Species: Eu(OH)CO3(aq)

species name Eu(OH)CO3(aq) EuOHCO3(aq) 4/15/92
Comments: standard naming conventions

****

Species: Eu2(CO3)3:3H2O

reactio coeff 0.000 -3.000 H+ 4/15/92
Comments: new aux set

reactio coeff 3.000 CO3-- 3.000 HCO3- 4/15/92
Comments: new aux set

****

Species: EuCO3+

reactio coeff 0.000 -1.000 H+ 4/15/92
Comments: new aux set

reactio coeff 1.000 CO3-- 1.000 HCO3- 4/15/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				

****

Species: EuOH(CO3)2--

reactio	coeff	-1.000 H+	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: EuOHCO3(aq)

reactio	coeff	-1.000 H+	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: FeCO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				
tpgrid	logk	25.000 4.730	25.000 500.000	4/15/92
Comments: rewrite reaction				
basic	logk	500.000	4.730	4/15/92
Comments: rewrite reaction				

****

Species: FeCO3+

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				
tpgrid	logk	25.000 9.720	25.000 500.000	4/15/92
Comments: rewrite reaction				
basic	logk	500.000	9.720	4/15/92
Comments: rewrite reactions				

****

Species: FePO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 7.930	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	7.930	4/21/92
Comments: rewrote reactions				

****

Species: Glycine(aq)

reactio	coeff	-3.500 O2(g)	-1.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	1.000 NO3-	-1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	0.000	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	2.000 HCO3-	1.000 Acetic a	4/14/92
Comments: new aux set				
reactio	coeff	3.000 H+	1.000 NH4+	4/14/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

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			

****

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: 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			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	1.000 H+	1.000 SO3--	3/27/92
Comments: wolery				

****

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: Hinsdalite

reactio	coeff	-6.000 H+	-7.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 -2.500	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	-2.500	4/21/92
Comments: rewrote reactions				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Hopeite

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 -35.300	25.000 500.000	4/21/92
Comments:	rewrote reactions			
basic	logk	500.000	-35.300	4/21/92
Comments:	rewrote reactions			

****

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-

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

****

Species: Ice

reactio	coeff	1.000 H+	1.000 H2O	4/17/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Methanamine(aq)

reactio	coeff	-3.500 O2(g)	-0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 H2O	-1.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 HCO3-	0.500 Acetic a	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 NO3-	1.000 NH4+	4/14/92
Comments:	new aux set			

****

Species: Methanol(aq)

reactio	coeff	-1.500 O2(g)	-0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 H+	0.500 Acetic a	4/14/92
Comments:	new aux set			

****

Species: Mg2CO3++

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: MgPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
tpgrid	logk	25.000 6.589	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	6.589	4/21/92
Comments: rewrote reactions				

****

Species: Mn3(PO4)2

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 -23.827	25.000 500.000	4/21/92
Comments: rewrite reactions				
basic	logk	500.000	-23.827	4/21/92
Comments: rewrite reactions				

****

Species: MnCO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				
tpgrid	logk	25.000 4.520	25.000 500.000	4/15/92
Comments: rewrite reaction				
basic	logk	500.000	4.520	4/15/92
Comments: rewrote reaction				

****

Species: MnPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.180	25.000 500.000	4/21/92
Comments: rewrote reactions				
basic	logk	500.000	6.180	4/21/92
Comments: rewrote reactions				

****

Species: NH3(aq)

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

****

Species: NaCO3-

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: NaNpO2CO3:3.5H2O

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: Ni(OH)2(aq)

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 8.000	25.000 500.000	4/17/92
Comments:	rewrote reaction			

****

Species: Ni(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 11.000	25.000 500.000	4/17/92
Comments:	rewrote reaction			

****

Species: Ni4(OH)4++++

reactio	coeff	0.000	-4.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/17/92
Comments:	new aux set			
tpgrid	logk	25.000 28.300	25.000 500.000	4/17/92
Comments:	rewrote reaction			
basic	logk	0.000	28.300	4/17/92
Comments:	rewrote reaction			

****

Species: NiCO3

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Np(CO3)5(6-)

reactio	coeff	0.000	-5.000 H+	4/15/92
Comments:				
reactio	coeff	5.000 CO3--	5.000 HCO3-	4/15/92
Comments:				
basic	logk	500.000	38.300	4/15/92
Comments:	rewrote reaction			

****

Species: NpO2(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments:	new aux set			
basic	logk	500.000	14.000	4/15/92
Comments:	rewrote reaction			

****

Species: NpO2(CO3)2---

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments:	new aux set			
basic	logk	500.000	7.000	4/15/92
Comments:	rewrote reaction			

****

Species: NpO2(CO3)3(5-)

reactio	coeff	0.000	-3.000 H+	4/15/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	8.500	4/15/92
Comments: rewrote reactions				

****

Species: NpO2(CO3)3----

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	20.400	4/15/92
Comments: rewrote reaction				

****

Species: NpO2CO3-

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments: new aux set				
basic	logk	500.000	4.600	4/15/92
Comments: rewrote reaction				

****

Species: Pb(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Pb(OH)2(aq)

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			

****

Species: Pb(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			

****

Species: PbCO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

****

Species: PbOH+

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: Plumbogummite

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	-5.000 H+	-7.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 -32.790	25.000 500.000	4/21/92
Comments:	rewrite reactions			
basic	logk	500.000	-32.790	4/21/92
Comments:	rewrite reactions			

****

Species: Pu(OH)2.5Cl0.5

reactio	coeff	0.000	-2.500 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.500 OH-	2.500 H2O	4/17/92
Comments:	new aux set			

****

Species: Pu(OH)4CO3--

reactio	coeff	0.000	-5.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/15/92
Comments:	new aux set			

****

Species: PuCO3++

reactio	coeff	0.000	-1.000 H+	4/15/92
Comments:	new aux set			
reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
tpgrid	logk .	25.000 -15.300	25.000 500.000	4/15/92
Comments: rewrote reactions				

****

Species: PuO2(CO3)2--

reactio	coeff	0.000	-2.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: PuO2(CO3)3----

reactio	coeff	0.000	-3.000 H+	4/15/92
Comments: new aux set				
reactio	coeff	3.000 CO3--	3.000 HCO3-	4/15/92
Comments: new aux set				

****

Species: PuO2(OH)2HCO3-

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments: new aux set				
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments: new aux set				

****

Species: Pyromorphite

reactio	coeff	0.000	-3.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	3.000 PO4---	3.000 HPO4--	4/21/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

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: S2O4--

reactio	coeff	-1.500 O2(g)	-1.000 S2O4--	4/14/92

Comments: new aux set

reactio	coeff	-1.000 S2O4--	0.500 O2(g)	4/14/92

Comments: new aux set

reactio	coeff	-1.000 H2O	1.000 S2O3--	4/14/92

Comments: new aux set

species	type	aqueous	aux	4/14/92

Comments: new aux set

****

Species: S2O5--

reactio	coeff	-1.000 H2O	-1.000 S2O5--	4/14/92

Comments: new aux set

reactio	coeff	-1.000 S2O5--	1.000 O2(g)	4/14/92

Comments: new aux set

reactio	coeff	-1.000 O2(g)	1.000 S2O3--	4/14/92

Comments: new aux set

species	type	aqueous	aux	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: new aux set

****

Species: S2O6--

reactio	coeff	-1.000 H2O	-1.000 S2O6--	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S2O6--	1.000 S2O3--	4/14/92
Comments: new aux set				
reactio	coeff	-0.500 O2(g)	1.500 O2(g)	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S2O8--

reactio	coeff	-1.000 H2O	-1.000 S2O8--	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S2O8--	1.000 S2O3--	4/14/92
Comments: new aux set				
reactio	coeff	0.500 O2(g)	2.500 O2(g)	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S3--

reactio	coeff	-2.000 H2O	-1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 O2(g)	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	3.000 HS-	1.000 HS-	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	0.000	1.000 S2--	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S3O6--

reactio	coeff	-2.000 O2(g)	-0.500 H2O	4/14/92
Comments: new aux set				
reactio	coeff	-2.000 H2O	-1.000 S3O6--	4/14/92
Comments: new aux set				
reactio	coeff	3.000 SO4--	1.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	4.000 H+	1.000 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S3O6--	1.500 S2O3--	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: S4--

reactio	coeff	-3.000 H2O	-1.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.500 O2(g)	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	4.000 HS-	2.000 S2--	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: S4O6--

reactio	coeff	-3.000 H2O	-1.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	-3.500 O2(g)	-1.000 S4O6--	4/14/92
Comments:	new aux set			
reactio	coeff	6.000 H+	0.500 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	4.000 SO4--	2.000 H+	4/14/92
Comments:	new aux set			
reactio	coeff	-1.000 S4O6--	2.000 S2O3--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S5--

reactio	coeff	-4.000 H2O	-2.000 H2O	4/14/92
Comments:	new aux set			
reactio	coeff	5.000 HS-	1.000 HS-	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 O2(g)	1.000 O2(g)	4/14/92
Comments:	new aux set			
reactio	coeff	0.000	2.000 S2--	4/14/92
Comments:	new aux set			
species	type	aqueous	aux	4/14/92
Comments:	new aux set			

****

Species: S5O6--

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	-5.000 O2(g)	-0.500 H2O	4/14/92
Comments: new aux set				
reactio	coeff	-4.000 H2O	-1.000 S5O6--	4/14/92
Comments: new aux set				
reactio	coeff	8.000 H+	0.500 O2(g)	4/14/92
Comments: new aux set				
reactio	coeff	5.000 SO4--	1.000 H+	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 S5O6--	1.500 S2O3--	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: SCN-

reactio	coeff	3.000 H+	-1.000 SCN-	4/14/92
Comments: new aux set				
reactio	coeff	1.000 SO4--	-3.000 H2O	4/14/92
Comments: new aux set				
reactio	coeff	1.000 NO3-	1.000 HCO3-	4/14/92
Comments: new aux set				
reactio	coeff	1.000 HCO3-	1.000 HS-	4/14/92
Comments: new aux set				
reactio	coeff	-1.000 SCN-	1.000 NH4+	4/14/92
Comments: new aux set				
species	type	aqueous	aux	4/14/92
Comments: new aux set				

****

Species: SO2(aq)

reactio	coeff	1.000 SO4--	1.000 SO3--	3/30/92
Comments: updating aux set				

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	-0.500 O2(g)	2.000 H+	3/30/92
Comments:	updating aux set			

****

Species: ScN-

species	name	ScN-	SCN-	4/14/92
Comments:	capitalized incorrectly			

****

Species: SiF6--

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

****

Species: Sn(OH)2(aq)

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-20.080	4/17/92
Comments:	rewrote reactions			

****

Species: Sn(OH)2++

reactio	coeff	0.000	-2.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	2.000 OH-	2.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-27.800	4/17/92
Comments:	rewrote reaction			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: Sn(OH)3+

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-42.500	4/17/92
Comments:	rewrote reactions			

****

Species: Sn(OH)3-

reactio	coeff	0.000	-3.000 H+	4/17/92
Comments:	new aux set			
reactio	coeff	3.000 OH-	3.000 H2O	4/17/92
Comments:	new aux set			
basic	logk	500.000	-24.580	4/17/92
Comments:	new aux set			

****

Species: Sn(OH)4(aq)

reactio	coeff	0.000	-4.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	4.000 OH-	4.000 H2O	4/21/92
Comments:	new aux set			
basic	logk	500.000	-56.830	4/21/92
Comments:	rewrote reaction			

****

Species: SnOH+

reactio	coeff	0.000	-1.000 H+	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: new aux set				
reactio	coeff	1.000 OH-	1.000 H2O	4/21/92
Comments: new aux set				
basic	logk	500.000	-10.010	4/21/92
Comments: rewrote reaction				

****

Species: SnOH+++

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 OH-	1.000 H2O	4/21/92
Comments: new aux set				
basic	logk	500.000	-14.600	4/21/92
Comments: rewrote reaction				

****

Species: SrCO3(aq)

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

****

Species: SrPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 5.480	25.000 500.000	4/21/92
Comments: rewrite reaction				
basic	logk	500.000	5.480	4/21/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: rewrite reactions

****

Species: Tl+++

species	type	aqueous	aux	3/30/92

Comments: wolery

****

Species: Tsumebite

reactio	coeff	-3.000 H+	-4.000 H+	4/21/92

Comments: new aux set

reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

Comments: new aux set

tpgrid	logk	25.000 -9.790	25.000 500.000	4/21/92

Comments: rewrote reactions

basic	logk	500.000	-9.790	4/21/92

Comments: rewrote reactions

****

Species: U(CO3)2

reactio	coeff	0.000	-2.000 H+	4/15/92

Comments: new aux set

reactio	coeff	2.000 CO3--	2.000 HCO3-	4/15/92

Comments: new aux set

****

Species: U(CO3)4----

reactio	coeff	0.000	-4.000 H+	4/15/92

Comments: new aux set

reactio	coeff	4.000 CO3--	4.000 HCO3-	4/15/92

Comments: new aux set

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: U(SCN)2++

reactio	coeff	8.000 H+	-1.000 U(SCN)2	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 SO4--	1.000 U++++	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 NO3-	2.000 SCN-	4/14/92
Comments:	new aux set			

****

Species: U(ScN)2++

species	name	U(ScN)2++	U(SCN)2++	4/14/92
Comments:	capitalized wrong			

****

Species: U3P4

reactio	coeff	0.000	-4.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	4.000 PO4---	4.000 HPO4--	4/21/92
Comments:	new aux set			

****

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			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: UO2(H2PO4)2(aq)

reactio	coeff	4.000 H+	2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: UO2(H2PO4)H3PO4+

reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			
reactio	coeff	5.000 H+	3.000 H+	4/21/92
Comments:	new aux set			

****

Species: UO2(SCN)2(aq)

reactio	coeff	6.000 H+	-1.000 UO2(SCN	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 SO4--	1.000 UO2++	4/14/92
Comments:	new aux set			
reactio	coeff	2.000 NO3-	2.000 SCN-	4/14/92
Comments:	new aux set			

****

Species: UO2(SCN)3-

reactio	coeff	9.000 H+	-1.000 UO2(SCN	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 SO4--	1.000 UO2++	4/14/92
Comments:	new aux set			
reactio	coeff	3.000 NO3-	3.000 SCN-	4/14/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Comments: new aux set

****

Species: UO2(ScN)2(aq)

species	name	UO2(ScN)2(aq)	UO2(SCN)2(aq)	4/14/92

Comments: capitalized wrong

****

Species: UO2(ScN)3-

species	name	UO2(ScN)3-	UO2(SCN)3-	4/14/92

Comments: name capitalized incorrectly

****

Species: UO2CO3(aq)

reactio	coeff	0.000	-1.000 H+	4/15/92

Comments: new aux set

reactio	coeff	1.000 CO3--	1.000 HCO3-	4/15/92

Comments: new aux set

****

Species: UO2H2PO4+

reactio	coeff	2.000 H+	1.000 H+	4/21/92

Comments: new aux set

reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

Comments: new aux set

****

Species: UO2H3PO4++

reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92

Comments: new aux set

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
reactio	coeff	3.000 H+	2.000 H+	4/21/92
Comments:	new aux set			

****

Species: UO2HPO4

reactio	coeff	1.000 H+	1.000 HPO4--	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 UO2++	4/21/92
Comments:	new aux set			
tpgrid	logk	25.000 -25.000	25.000 500.000	4/21/92
Comments:	rewrite reaction			
basic	logk	500.000	-25.000	4/21/92
Comments:	rewrite reaction			

****

Species: UO2HPO4:4H2O

reactio	coeff	1.000 H+	1.000 HPO4--	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 UO2++	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 UO2++	4.000 H2O	4/21/92
Comments:	new aux set			

****

Species: UO2PO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			

****

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

Species: UO2SCN+

reactio	coeff	3.000 H+	-1.000 UO2SCN+	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 SO4--	1.000 SCN-	4/14/92
Comments:	new aux set			

****

Species: UO2ScN+

species	name	UO2ScN+	UO2SCN+	4/14/92
Comments:	name capitalized incorrectly			

****

Species: UP

reactio	coeff	2.000 H+	1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: UP2

reactio	coeff	4.000 H+	2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: UP2O7

reactio	coeff	4.000 H+	2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE

****

Species: UPO5

reactio	coeff	2.000 H+	1.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: USCN+++

reactio	coeff	5.000 H+	-1.000 USCN+++	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 SO4--	1.000 SCN-	4/14/92
Comments:	new aux set			
reactio	coeff	1.000 UO2++	1.000 U++++	4/14/92
Comments:	new aux set			

****

Species: UScN+++

species	name	UScN+++	USCN+++	4/14/92
Comments:	capitalized incorrectly			

****

Species: Vivianite

reactio	coeff	0.000	-2.000 H+	4/21/92
Comments:	new aux set			
reactio	coeff	2.000 PO4---	2.000 HPO4--	4/21/92
Comments:	new aux set			

****

Species: Witherite

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
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				

****

Species: ZnPO4-

reactio	coeff	0.000	-1.000 H+	4/21/92
Comments: new aux set				
reactio	coeff	1.000 PO4---	1.000 HPO4--	4/21/92
Comments: new aux set				
tpgrid	logk	25.000 6.350	25.000 500.000	4/21/92
Comments: rewrite reaction				
basic	logk	500.000	6.350	4/21/92
Comments: rewrite reactions				

Appendix D2: GEMBOCHS Audit Table: DATA0 Suite R14 to R15

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
*****	*****	*** *****	*** *****	****

****

Species: NaOH(aq)

basic	logk	-14.180	-0.180	6/ 2/92
Comments: correct logk for ref. reaction				

****

Species: UO2.25

cp6	t_2	0.000	-1.786e+007	6/ 9/92
Comments: data in 90nea				
cp6	t1	0.000	-6.974	6/ 9/92
Comments: data in 90nea				
cp6	limit	298.150	0.000	6/ 9/92
Comments: data in 90nea				
cp6	t2	0.000	0.010	6/ 9/92
Comments: data in 90nea				
cp6	t0	0.000	1487.600	6/ 9/92
Comments: data in 90nea				

****

Species: UO3(beta)

cp6	limit	298.150	0.000	6/ 9/92
Comments: data in 90nea				

****

Species: UO3(epsil)

cp6	t_2	0.000	-1.013e+006	6/10/92
Comments: data in 90nea				
cp6	t1	0.000	0.017	6/10/92
Comments: data in 90nea				
cp6	limit	0.000	850.000	6/10/92

TABLE	COLUMN	OLD VALUE	NEW VALUE	DATE
Comments: data in 90nea				
cp6	t0	0.000	88.103	6/10/92
Comments: data in 90nea				