A User's Guide to the Comprehensive Water Quality Database for Groundwater in the Vicinity of the Nevada Test Site

Rev. 1

September 2006

Prepared for U.S. Department of Energy under Contract No. DE-AC52-03NA99205.

Approved for public release; further dissemination unlimited

A USER'S GUIDE TO THE COMPREHENSIVE WATER QUALITY DATABASE FOR GROUNDWATER IN THE VICINITY OF THE NEVADA TEST SITE

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Stoller-Navarro Joint Venture
7710 W. Cheyenne, Bldg. 3
Las Vegas, Nevada 89129

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COMPREHENSIVE WATER QUALITY DATABASE
FOR GROUNDWATER IN THE VICINITY OF
THE NEVADA TEST SITE**

Approved by: _____

Date: _____

John McCord, Project Manager
Underground Test Area

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List of Acronyms and Abbreviations

ASTM	American Society for Testing and Materials
BN	Bechtel Nevada
°C	Degrees Celsius
CD	Compact disc
CDR	Common Data Repository
DDF	Data Documentation Flag
DEF	Data Evaluation Flag
DOE	U.S. Department of Energy
DRI	Desert Research Institute
EPA	U.S. Environmental Protection Agency
HRCES	Harry Reid Center for Environmental Studies
IT	IT Corporation
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NTS	Nevada Test Site
NWIS	National Water Information System
pCi/L	Picocuries per liter
QA/QC	Quality assurance/quality control
RCRA	<i>Resource Conservation and Recovery Act</i>
REEC	Reynolds Electrical & Engineering Co., Inc.
SNJV	Stoller-Navarro Joint Venture
UGTA	Underground Test Area
USAF	U.S. Air Force
USGS	U.S. Geological Survey

1.0 Introduction

This water quality database (viz. GeochemXX.mdb) has been developed as part of the Underground Test Area (UGTA) Program with the cooperation of several agencies actively participating in ongoing evaluation and characterization activities under contract to the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO). The database has been constructed to provide up-to-date, comprehensive, and quality controlled data in a uniform format for the support of current and future projects.

This database provides a valuable tool for geochemical and hydrogeologic evaluations of the Nevada Test Site (NTS) and surrounding region. Chemistry data have been compiled for groundwater within the NTS and the surrounding region. These data include major ions, organic compounds, trace elements, radionuclides, various field parameters, and environmental isotopes. Colloid data are also included in the database.

The GeochemXX.mdb database is distributed on an annual basis. The extension "XX" within the database title is replaced by the last two digits of the release year (e.g., Geochem06 for the version released during the 2006 fiscal year). The database is distributed via compact disc (CD) and is also uploaded to the Common Data Repository (CDR) in order to make it available to all agencies with DOE intranet access. This report provides an explanation of the database configuration and summarizes the general content and utility of the individual data tables. In addition to describing the data, subsequent sections of this report provide the data user with an explanation of the quality assurance/quality control (QA/QC) protocols for this database.

A letter distributed with the database presents relevant information for the updates found in the current release.

2.0 Presentation of Data

GeochemXX.mdb is a relational database, maintained in Microsoft Access®. Data have been incorporated into six main tables: *tblSampleLoc*, *tblSampleData*, *tblSampleResults*, *tblColloidResults*, *tblSampleRefs*, and *tblNFtestsData*. These main tables are accompanied by several comment tables, domain tables, and a database logbook. These additional tables have been created for the purpose of clarification and to facilitate the management and extraction of data. The tables described within this section can be viewed through the *Database Window* within GeochemXX.mdb. The *Database Window* displays the database objects (Tables, Queries, Forms, Reports, Pages, Macros, and Modules) in tabular panes and can be accessed by simply pressing the **F11** key on the keyboard. Selection of “Tables” will then reveal the names of all tables contained within the database. The specific table can then be selected for viewing or modification. A diagram of the relationships between the tables within GeochemXX.mdb is shown in [Figure 2-1](#). To view these relationships within the database, select **Tools** on the toolbar, then **Relationships**. Supporting data dictionary documentation for each table can be viewed by right-clicking inside the table and then selecting **Table Design**.

The remainder of this section will be spent explaining the contents, database relationships, and intended use of the tables found in the database.

2.1 *tblSampleLoc*

The *tblSampleLoc* table contains location information for the sampling sites included within the database. An example of the data contained within the fields in the *tblSampleLoc* table is presented in [Table 2-1](#). Each field is described as follows:

- **Master_ID** - Master Identification. Acts as a unique control number for each location. In most cases, the U.S. Geological Survey (USGS) site identification nomenclature has been used. This naming convention combines the geographical (degrees-minutes-seconds) latitude, longitude, and sequence into a numerical string that is unique to each location. In many instances (particularly for locations outside the NTS), this naming convention has been based on an estimated location. Wherever this convention has been used, efforts have been made to ensure that the numerical string can be matched to a corresponding site location in the USGS National Water Information System (NWIS). Some “Master_IDs” use an alpha-numeric text string for their control number. These locations have yet to be reconciled with NWIS or they are not included in NWIS.

Figure 2-1
Relationships Within GeochemXX.mdb

Table 2-1
Example of Data Fields in *tb/SampleLoc*

MASTER_ID	Index	Index_Ref	SITE_ID	Site Type	TwN-Rng-Sect	Hydrographic Basin	Latitude -Dec	Longitude -Dec	Datum	Coordinate Origins	Location Comment
371117116122801	8	Borehole Index	U12e.03, 9+20, Drift	Seep	09S/52E-05-6	Sand Spring-Tikaboo Valleys	37.19	116.21	NAD27	USGS-NWIS (01/22/02)	
371537116251501	18	Borehole Index	ER-20-6 #1	Well	08S/50E-08-7	Cactus-Sarcobatus Flats	37.26	116.42		USGS-NWIS (01/22/02)	
370116115561301	550	Borehole Index	ER-3-1 #1, deep	Well	10S/54E-35-1	Sand Spring-Tikaboo Valleys	37.02	115.94	NAD27	USGS-NWIS (01/22/02)	
ER-3-1	550	Borehole Index	ER-3-1	Well		Sand Spring-Tikaboo Valleys	37.02	115.94	NAD27	Borehole Index (10/30/01)	
383556114545901	725	DRI Spring Index	Big Spring, Dry Lake Valley	Spring	09N/63E-33-1	Dry Lake Valley	38.60	114.92		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
381305116414001	837	DRI Spring Indx	Fourmile Spring	Spring	04N/47E-10aaa1	Ralston Valley	38.22	116.69		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
362324116163900	1433	DRI Spring Index	Jack Rabbit Spring	Spring	18S/51E-18-1	Panamint	36.39	116.28		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
362230116162001	1434	DRI Spring Index	Big Spring, Ash Meadows	Spring	18S/51E-19acb1	Amargosa River	36.37	116.27		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
Snake_Big	1473	DRI Spring Index	Big Spring, Snake Valley	Spring		Hamlin	38.70	114.13		Spring Index (09/09/2003)	Lat/Long revised to accurately locate spring.
382214115285201	1534	DRI Spring Index	Big Spring, White River Valley	Spring	06N/58E-20-1	White River Valley	38.37	115.48		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
383922114375901	1535	DRI Spring Index	Big Spring North, Dry Lake Valley	Spring	09N/65E-12bd1	Dry Lake Valley	38.66	114.63		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
383915114375901	1536	DRI Spring Index	Big Spring South, Dry Lake Valley	Spring	09N/65E-12ca1	Dry Lake Valley	38.65	114.63		Spring Index (09/09/2003)	Reconciled with DRI Spring Index
365904115593401	1939	Borehole Index	ER-6-1	Well	11S/54E-18-3	Sand Spring-Tikaboo Valleys	36.98	115.99	NAD27	USGS-NWIS (01/22/02)	
370301116185801	3809	Borehole Index	ER-30-1 #1, deep	Well	10S/51E-20-1	Upper Amargosa	37.05	116.32	NAD27	USGS-NWIS (01/22/02)	
370301116185802	3809	Borehole Index	ER-30-1 #2, shallow	Well	10S/51E-20-2	Upper Amargosa	37.05	116.32	NAD27	USGS-NWIS (01/22/02)	

Note: The data shown in this table are for demonstrative purposes only and should not be used for further reporting or calculations. The following six data fields are not shown in this example: Lat-DMS, Long-DMS, STP-North, STP-East, UTM-North, UTM-East.

The site name from the original reporting source has often been retained as an alternative to the USGS numerical identifier.

- **Index** - Location Index. Numerical value assigned to a given sample site that corresponds to either the Borehole Index or the Desert Research Institute (DRI) Spring Database.
- **Index_Ref** - Index Reference. Identifies the source of the Index.
- **Site_ID** - Site Identification. Unique name for a given sample location. Compiling data from multiple information sources has resulted in multiple reporting names for many sample locations. Some data sources use variations on a common name while others use variations on geographical location (e.g., township, range, and section information) as site identifiers. Wherever possible this information has been reconciled into a single reporting name in the "Site_ID" field consistent with the NTS Redbook, NWIS database, or the DRI Spring Database. In order to distinguish locations with similar reporting names, the "Site_ID" is a combination of the common name and either the township, range and section location, or the hydrographic region.
- **Tw-n-Rng-Sect** - Township, Range, and Section Information. The township, range, and section information is further qualified by section modifiers. Section modifiers further divide the section into 1/4-section, 1/4-1/4-section, and 1/4-1/4-1/4-section, using a string of letters that corresponds to a predetermined location within the section ([Figure 2-2](#)). The first letter in the string (a, b, c, or d) is assigned to a 1/4-section location in a counterclockwise fashion. Subsequent letters in the string continue to modify the location in a similar fashion, providing cartographic resolution down to a 1/4-1/4-1/4-section scale. For incidences where there are multiple sample locations having the same township, range, section, and section modifier, a numerical sequence number is added to the end of the section modifier-string. Sequence numbers are assigned based on the order in which the sample point was established.
- **SiteType** - Type of Sampling Location. Identifies the site as either a Nearfield Well, Monitoring Well, Domestic Well, Irrigation Well, Municipal Well, Spring, Seep, Precipitation Station, or Stream.
- **Hydrographic Basin** - Identifies the specific hydrographic basin in which the site is located.
- **Latitude-Dec** and **Longitude-Dec** - Decimal Latitude and Longitude Coordinates. Describes the geographical decimal coordinate locations for each site. Decimal coordinates have been used as the common reporting coordinates for this database. Other reporting coordinates are **Lat-DMS**, **Long-DMS**, **STP-North**, **STP-East**, **UTM-North**, and **UTM-East**. Locations lacking geographic coordinate information will be reconciled with outside sources as additional information becomes available in subsequent versions of the database.

Figure 2-2
Relative Location of Section Modifiers

- **Datum** - Coordinate Datum. Identifies the standardized coordinate/elevation datum.
- **Coordinate Origins** - Describes the source of the coordinates, further described in the *tblSampleLocComments* table.
- **Location Comment** - Reports comments regarding the location reconciliation process.

2.2 *tblSampleData*

The *tblSampleData* table contains information unique to a particular sample or sampling event. An example of this information is provided in [Table 2-2](#).

The “**Sample_ID**” acts as a unique control number, distinguishing sample events based on sample collection dates, sample collection times, sampling agency, reported activity dates for radionuclide data, sampling methods, and sampling depths. The data contained in the *tblSampleData* table are linked to geographic location information in the *tblSampleLoc* table using the “**Master_ID**.” Each field in the *tblSampleData* table is summarized as follows:

- **Auto_ID** - AutoNumber Identification. An automatically generated number to enhance database integrity.
- **Sample_ID** - Sample Identification. Data control number assigned by the database manager for the purpose of linking sampling event information to analytical results for the sample. Note: The “**Sample_ID**” for a duplicate sample is given an extension of “.5” and a “**Sample_ID**” for colloid is given an extension of “.7.”
- **Master_ID** - Master Identification. Correlates to the “**Master_ID**” field in the *tblSampleLoc* table and is used to link sampling event information to geographic location information.
- **S_Date** - Sample Date. Sample collection date is reported in a “yyyymmdd” text format. It is possible that the related sample results correspond to a known sampling event for a given location; however, if this information was not reported in the original source, it has been reported as “N/A” (not available) in the database.
- **S_Date2** - Sample Date. Sample collection date reported in a “mm/dd/yyyy” numerical format. If this information was not reported in the original source, this field has been left blank.
- **A_Date** - Activity Date. Distinguishes between reported radionuclide activity dates and sample collection dates. For those radionuclide parameters where this field is blank, it is assumed that the activity date corresponds to the sample collection date. Where it has been confirmed that this is the case, the “**A_Date**” field reports the same value as the

Table 2-2
Example of Data Fields in *tblSampleData*

Auto ID	Sample_ID	Master_ID	S_Date	S_Date2	A_Date	S_Time	S_Method	S_Depth_Slant	S_Depth	S_Depth Units	S_Comment
1	4018	Jackass Flats Well No. 1	19570918	09/18/1957		N/A	dd		1327	feet BGS	
2	304	361833115372501	19800722	7/22/1980		1500					
3	305	361835115153701	19950314	3/14/1995		N/A					
4	306	361840115153901	19820517	5/17/1982		1230	dd		91.44	meters	
5	307	361840115153901	19820823	8/23/1982		1000	dd		91.44	meters	
6	4016	362324116163900	19661115	11/15/1966		N/A					
7	4017	362324116163900	19701015	10/15/1970		N/A					
8	4019	Jap Ranch Contact Spring	19661120	11/20/1966		1245					
9	4020	Jean Prison Well	19850621	06/21/1985		N/A	c				
10	5145	370514116024101	19990817	08/17/1999		N/A	dd	975	914	meters	
11	5146	370514116024101	19950719	07/19/1995	19810115	N/A			549	meters	
12	5147	370514116024101	19950719	07/19/1995	19810115	N/A			584	meters	
13	5148	370520116025701	19930831	08/13/1993	19930920	N/A			496	meters	
14	9016	371425116251901	19870720	07/20/1987		N/A			2400	ft	
15	11736	371453116205700	19950719	07/19/1995	19810115	N/A	dd		427	meters	
16	12147	370338116011901	19770930	09/30/1977			c		512-527	m	well purge volume 13.63 m ³
17	12153	370338116011901	19770929	09/29/1977			c		512-527	m	well purge volume 3.79 m ³

Note: The data shown in this table are for demonstrative purposes only and should not be used for further reporting or calculations.

“S_Date” field. Where the reported activity date precedes the sample collection date, the radionuclide activities are reported according to the indicated time zero (t_0). Where the reported activity date supersedes the sample collection date, the radionuclide activities are reported to a sample analysis or sample extraction date.

- **S_Time** - Sample Time. Sample collection time is reported in a 24-hour “hhmm” format. Sample collection times have been included whenever they have been reported in the original source. Sample collection times are useful for distinguishing between multiple sampling events for the same parameters on the same day.
- **S_Method** - Sample Method. Describes discrete depth or composite sampling. In addition, this field identifies duplicate and replicate samples. Duplicate samples are further distinguished as field duplicates (i.e., separate samples collected in the field) and laboratory duplicates (i.e., a single sample that is collected in the field and split in the laboratory for analysis). Codes assigned are described in the *dmnSampleMethodCodes* table.
- **S_Depth_Slant** - Slant Sampling Depth. Describes the slant distance of a sample collection point along the well bore below ground surface.
- **S_Depth** - Sample Depth. Describes the vertical sampling depth or sampling depth interval information.
- **S_Depth Units** - Sample Depth Units. Units associated with the sampling depth and sampling depth interval information. In some cases, this field includes distance information relative to a test cavity.
- **S_Comment** - Sampling Comment. Reports comments provided by the data source regarding sample collection.

2.3 *tblSampleResults*

The *tblSampleResults* table contains analytical results and methodology for specific samples or sampling events. An example of this information is provided in [Table 2-4](#). The *tblSampleResults* table is linked to sample information in the *tblSampleData* table using the “Sample_ID.” The *tblSampleResults* table is the primary data table. There are several domain tables that describe the contents of several of the fields within the *tblSampleData* table. Each field within the *tblSampleResults* table and its relationship to other tables is summarized as follows:

- **Auto_ID** - AutoNumber Identification. A number automatically generated to enhance database integrity and provide unique identification for sample results data.

- **Sample_ID** - Sample Identification. Correlates to the “Sample_ID” field in the *tblSampleData* table and is used to link analytical results and analytical methodology to sample information. Although “Sample_IDs” in the *tblSampleData* table are unique, they can be repeated multiple times with different parameters in the *tblSampleResults* table.
- **REF_ID** - Reference Identification. Correlates to the “Ref_ID” field in the *tblSampleRefs* table and is used to link analytical results and analytical methodology to the original reporting source. In many instances, there are multiple data sources reporting diverse analytical information for a given sampling event. Similarly, a given data source typically reports data for multiple sampling events or sample locations. Hence, values for “Ref ID,” though unique in the *tblSampleRefs* table, may be repeated multiple times in the *tblSampleResults* table.
- **CategoryID** - Parameter Category Identification. The “CategoryID” is used to group types of sample analyses into categories. Used specifically in the front-end user interface options. The eight categories are listed in [Table 2-3](#) as well as in the *dmnParmCategory* domain table.

Table 2-3
List of Parameter Categories

CategoryID	Category
1	Minor and Trace Constituents
2	Environmental Isotope and Tracers
3	Radionuclides
4	Organics and Hydrocarbons
6	Physical, Field, and Miscellaneous
7	Colloids
10	QA/QC
11	Major Constituents

- **S_Type** - Sample Type. Describes the type of the sample (filtered, unfiltered, tube, grab, drum) associated with the result record.
- **PARM** - Parameter. Analyte, parameter, and test names from original data sources have been reconciled as much as possible. As a result of this reconciliation process, a parameter domain table, *dmnParm*, has been compiled to standardize, wherever possible, the reporting format for the equivalent analyses. The “PARM” field is linked to the *dmnParm* table, ensuring parameter name compatibility for any new data entries or data modifications. Specification of “Total” and “Dissolved” in the parameter name corresponds to whether the sample was not filtered or filtered, respectively.

Table 2-4
Example of Data Fields in *tblSampleResults*

Auto ID	Sample ID	REF ID	Category ID	S_Type	PARM	Q	VAL	Activity (T test) - pCi/L	Unit	DetLim	Error	Procedure	R_Comment	DDF	DDF Comment	DEF	DEF Comment
7660	1	63	11	f	Cl, Dissolved		17.8		mg/L			EPA 325.1 and 300.0		4	D1	U	E1
7671	1	63	11	f	Mg, Dissolved		2.1		mg/L			EPA 242.1		4	D1	U	E1
7670	1	63	1	f	SiO2, Dissolved		70		mg/L			Not Available		4	D1	U	E1
7668	1	63	3	f	Tritium, Total		16		pCi/L			Not Available		4	D1	U	E1
7675	2	41	11	f	Ca, Dissolved		115		mg/L			Not Available		5	D1	U	E1
7672	2	41	11	f	HCO3, Dissolved		195		mg/L			Not Available		5	D1	U	E1
7674	2	41	6	f	pH		7.95		pH units			Not Available		5	D1	U	E1
7890	22	77	1	f	NO3, Dissolved	Trace	-7777		mg/L			Not Available		5	D1	U	E1
7903	24	77	11	f	CO3, Dissolved	ND	-9999		mg/L			Not Available		5	D1	U	E1
8669	84	62	11	f	Ca, Dissolved		126		mg/L			USGS 00915		4	D1	U	E1
8672	84	62	11	f	Cl, Dissolved		2010		mg/L			USGS 00940		4	D1	U	E1
8667	84	62	1	f	F, Dissolved		4.8		mg/L			USGS 00950		4	D1	U	E1
8666	84	62	11	f	SO4, Dissolved		763		mg/L			USGS 00945		4	D1	U	E1
90106	3911	72	2		He-4		4.89E+12		atoms/mL			Mass Spectrometry		3	D1	U	E1
90125	3911	72	2		Sr-87/Sr-86		0.71175		ratio		± 2E-5	Not Available		3	D1	U	E1
90094	3911	72	3		Sr-90	<	0.5		pCi/L			TIP-RAS-141		3	D1	U	E1
90098	3911	72	3	uf	Tritium		361		pCi/L		± 34	TIP-RAS-011		3	D1	U	E1
90129	3911	72	3		U-234/U-238		0.000275		ratio		± 3E-7	Not Available		3	D1	U	E1
135569	10309	311	1	uf	Mn, Total	<	0.0025		mg/L	0.0025		EPA 200.7		5	D9	U	E1
135571	10309	311	11	uf	Na, Total		77		mg/L	0.25		EPA 200.7		5	D9	U	E1
139386	12132	373	3	uf	Tritium		9890100	8.59E+07	pCi/L			LSC		1	D1		E1
139387	12132	373	3	f	U-234, Dissolved		10.51947	1.05E+01	pCi/L			calculated	0.45 um filter	1	D1		E1

Note: The data shown in this table are for demonstrative purposes only and should not be used for further reporting or calculations.

- **Q** - Data Qualifier. Data qualifiers from the original sources have been standardized as much as possible. For qualifiers having the same meaning, changing them to a uniform format facilitates the use of the data. A qualifier domain table, *dmnQualifierComments*, has been created for the purpose of explaining what each data qualifier means.
- **VAL** - Value, Analytical Result. This is the numerical value as reported in the original data source. In some cases, conversions of, or calculations based on, the original data have been included. Whenever this has been done, the converted data are qualified appropriately and the record is linked to the *tblSampleResults-Calculations* table, which describes the rationale behind and the methodology used in converting the original data. In instances where a result has been reported as nondetectable, in the absence of a detection limit, a numerical data flag has been used. Numerical data flags are always used in conjunction with a data qualifier. Accordingly, their use and meanings can be found in the *dmnQualifierComments* qualifier domain table.
- **Activity (T test) - pCi/L** - Measured activity corrected to zero time of the nuclear test. The tests and dates of tests corresponding to these activity values are reported in the *tblNFTestsData* table.
- **UNIT** - Analytical result reporting units. Reporting units have typically been retained from the original data sources.
- **DetLim** - Analytical Detection Limit. The limit of detection (or quantitation) that is associated with the measured parameter value.
- **Error** - Analytical Error. Describes the uncertainty associated with the measured parameter value reported by the original data source.
- **Procedure** - Reports the analytical method, procedure, or parameter code cited in the original data source where this information was available. Wherever possible, standard methodology (i.e., American Society for Testing and Materials [ASTM] or U.S. Environmental Protection Agency [EPA] methods) has been cited. In some cases, laboratory-specific standard operating procedures or types of analysis have been given. The USGS electronic data transfers used parameter codes for identifying test names and analytical methodology. Where available, these parameter codes have been reported in the "Procedure" field. The associated USGS methodology and a more detailed description of the procedures reported in this field can be found in the *dmnProceduresComments* table. The procedure domain table has been linked to the "Procedure" field, ensuring reporting consistency and compatibility for any new data entries or modifications.
- **R_Comment** - Results Comment. Reports comments regarding parameter measurements and results.

- **DDF** - Data Documentation Flag. Numerical criteria based on a scale of 1 to 5, where a value of “1” denotes the highest quality of documentation and a “5” is the lowest. Complete descriptions of the established criteria used to assign the Data Documentation Flags (DDFs) are found in the *dmnDocumentationQualifiers* DDF domain table.
- **DDF Comment** - Comment codes used to elaborate on the assignment of the DDF for a particular data source or individual results within the data source. These codes are described in the *dmnDDFCommentCodes* domain table.
- **DEF** - Data Evaluation Flag. Assigns a text abbreviation based on the quality of the actual data results. A “C” is used to denote data results that are consistent, an “NC” is used to denote inconsistent data results, and a “U” is used wherever the consistency of the data are unknown. Complete descriptions of the established criteria used to assign the Data Evaluation Flags (DEFs) are found in the *dmnEvaluationQualifiers* DEF domain table.
- **DEF Comment** - Comment codes used to elaborate on the assignment of the DEF for a particular data source or individual results within the data source. These codes are described in the *dmnDEFCommentCodes* domain table.

2.4 *tblColloidResults*

The *tblColloidResults* table contains analytical colloid measurements and methodology for specific samples or sampling events. The colloid data correspond to sampling events for which analytical chemistry data are available within the *tblSampleResults* table. Table 2-5 provides an example of the *tblColloidResults* table format. The table-linking relationships and data-field presentation for the *tblColloidResults* table are similar to that found in the *tblSampleResults* table. Colloid data are linked to individual sample events in the *tblSampleData* table. Each field and its relationship to other tables is summarized as follows:

- **Sample_ID** - Sample Identification. Correlates to “Sample_ID” in the *tblSampleData* table. This field links analytical colloid measurements and measurement methodology to sample and/or sampling event information. Although the “Sample_IDs” in the *tblSampleData* table are unique, they can be repeated multiple times with different parameters in the *tblColloidResults* table.
- **Ref_ID** - Reference Identification. Links analytical colloid measurements and measurement methodology to the original reported source described in the *tblSampleRefs* table. A given data source typically reports data for multiple sampling events or sample locations. Hence, values for “Ref_ID,” though unique in the *tblSampleRefs* table, may be repeated multiple times in the *tblColloidResults* table.

Table 2-5
Example of Data Fields in tblColloid Results

Sample_ID	Ref_ID	S_Type	CategoryID	Colloid_Particle_Size	Q	Value	Unit	ERROR	Procedure
4922.7	237	uf	7	Particle Size, 50-60 nm	<	801000	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 60-70 nm		1034820	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 70-80 nm		970140	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 80-90 nm		830840	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 90-100 nm		736320	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 100-110 nm		691540	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, 190-200 nm		119400	particles/mL		Not Available
4922.7	237	uf	7	Particle Size, >200 nm		129360	particles/mL		Not Available
7465.71	237		7	Particle Size, 50 nm		8685600	particles/mL		Not Available
7465.71	237		7	Particle Size, 60 nm		9184600	particles/mL		Not Available
7465.71	237		7	Particle Size, 70 nm		7387600	particles/mL		Not Available

Note: The data show in this table are for demonstrative purposes only and should not be used for further reporting or calculations.

- **S_Type** - Sample Type. Describes the type of the sample (filtered, unfiltered, tube, grab, drum) associated with the result record uncertainty associated with the colloid parameter measurement.
- **CategoryID** - Colloid Category Identification. The "CategoryID" is used to group types of sample analyses into categories and is used specifically in the front-end user interface options.
- **Colloid_Particle_Size** - Particle size or particle size range. Particle size and size ranges represent those reported in the original data sources.
- **Q** - Data Qualifier. Data qualifiers from the original sources have been standardized as much as possible. For qualifiers having the same meaning, changing them to a uniform format facilitates the use of the data. A qualifier domain table has been created for the purpose of explaining what each data qualifier means.
- **VAL** - Value, Analytical Result. Measured analytical result as reported in the original data source. In instances where a result has been reported as nondetectable, in the absence of a detection limit, a numerical data flag has been used. Numerical data flags are always used in conjunction with a data qualifier. Accordingly, their use and meanings can be found in the qualifier domain table.
- **Unit** - Analytical-result reporting units. Reporting units have been retained from the original data sources.
- **ERROR** - Analytical Error. Describes the uncertainty associated with the measured parameter value reported by the original data source.

- **Procedure** - Reports the analytical method, procedure, or parameter code cited in the original data source where this information was available. Wherever possible, standard methodology (i.e., ASTM or EPA methods) has been cited. In some cases, laboratory-specific standard operating procedures or types of analysis have been given. A more detailed description of the procedures reported in this field can be found in the *dmnProceduresComments* table. The procedure domain table has been linked to the “Procedure” field, ensuring reporting consistency and compatibility for any new data entries or modifications.

2.5 *tblNFTestsData*

The *tblNFTestsData* table contains information pertinent to identifying the test associated with a specific near-field well. The *tblNFTestsData* table is linked to information in the *tblSampleLoc* table using the “Master_ID” field. Each field and its relationship to other tables is summarized as follows:

- **Master_ID** - Master Identification. Correlates to the “Master_ID” field in the *tblSampleLoc* table and is used to link testing information to geographic location information.
- **Site_ID** - Site Identification. Correlates to the “Site_ID” field in the *tblSampleLoc* table.
- **Test_ID** - Test Identification. Emplacement Hole Identification.
- **Test Name** - Name of test associated with the near-field well.
- **Test Date** - Date of detonation.

2.6 *tblSampleRefs*

The *tblSampleRefs* table contains information pertinent to identifying the original data source and evaluating the quality of the data. An example of this information is provided in [Table 2-6](#). The *tblSampleRefs* table is linked to analytical information in the *tblSampleResults* table using the “Ref_ID” field. Each field and its relationship to other tables is summarized as follows:

- **Ref_ID** - Reference Identification. Data control number used to link data reference and source information to individual sample results in the *tblSampleResults* table.
- **Reference** - For publications, this is the source from which the data were extracted for integration into the database. For electronic data transmittals, personal communications, and other types of unpublished data, this is a description unique to the data source.

Table 2-6
Example of Data Fields in tblSampleRefs

Ref_ID	Reference	RefSource_Description	Bibliography	Source	Electronic	Electronic Filename
49	Malmberg and Eakin (1962)	Nevada Groundwater Resource Reconnaissance Series Report 10, 39 pages, US Geological Survey; Groundwater Appraisal of Sarcobatus flat and Oasis Valley, Nye and Esmerelda counties.	Malmberg, G.T., and T.E. Eakin. 1962. Groundwater Appraisal of Sarcobatus Flat and Oasis Valley, Nye and Esmerelda Counties, Groundwater Resource Reconnaissance Series Report 10. Carson City, NV: State of Nevada.	N/A	TRUE	Malmb606.wb1
50	McKinley et al. (1991)	U.S. Geological Survey Open File Report 90-355, 47 pages; Chemical analyses of Water from Selected Wells and Springs in the Yucca Mountain area, Nevada and Southeastern California. Accompanied by digital copies of the data tables, received March 1, 1993.	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, USGS-OFR-90-355. Denver, CO: U.S. Geological Survey.	Benson et al. (1983)	TRUE	OFR90-355.exe
51	McKinley et al. (1991)	U.S. Geological Survey Open File Report 90-355, 47 pages; Chemical analyses of Water from Selected Wells and Springs in the Yucca Mountain area, Nevada and Southeastern California. Accompanied by digital copies of the data tables, received March 1, 1993.	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, USGS-OFR-90-355. Denver, CO: U.S. Geological Survey.	Czarnecki Unpublished data	TRUE	OFR90-355.exe
105	DRI (1998 Pers. Comm.)	Courtesy of Ron Hershey, Desert Research Institute-Water Resource Center, 7010 Dandini Blvd., Reno, NV 89512; Compilation of field parameters, sample event information, carbon 13, oxygen 18, and deuterium data for 21 sites from the Nov-97 Oasis Valley sampling event.		Ron L. Hershey (DRI)	FALSE	Data not available in an electronic format
106	DRI (1998 Pers. Comm.)	Courtesy of Ron Hershey, Desert Research Institute-Water Resource Center, 7010 Dandini Blvd., Reno, NV 89512; Compilation of major ion and dissolved constituent data for 21 sites from the Nov-97 Oasis Valley sampling.		Ron L. Hershey (WRC Waterlab)	FALSE	Data not available in an electronic format
107	DRI (1998 Pers. Comm.)	Courtesy of Ron Hershey, Desert Research Institute-Water Resource Center, 7010 Dandini Blvd., Reno, NV 89512; Compilation of major ion and dissolved constituent data for 21 sites from the Nov-97 Oasis Valley sampling.		Ron L. Hershey (WRC Waterlab)	FALSE	Data not available in an electronic format
111	USGS (1998 Pers. Comm.)	Courtesy of Jim Paces, U.S. Geological Survey, Denver, CO; Dissolved uranium activity ratios for the Nov-1997 Oasis Valley sampling event, summarized in a table dated January 15, 1998.		Jim B. Paces (USGS-Denver)	FALSE	Data not available in an electronic format
112	USGS Electronic	Oliver and Root; unpublished (1997). Electronic compilation of isotope and ion data for Yucca Mtn; as per memo from Thomas Oliver (USGS) to Robert Craig (USGS) on July 21, 1997.		Thomas Oliver (07/22/97); YuccaMtn. Data	TRUE	Yucca.xls
114	GCP00485	Courtesy of IT Corporation, 2621 Losee Rd., Bldg B-1, Suite 3050-01, N. Las Vegas, NV 89030; Sample results corresponding to the sample identified under the UGTA-GCP naming convention. Digital data transmittal originating from the IT Environmental Monitoring System (ITEMS) Database.		GCP00485	TRUE	GCP Trace Metal Data.xls

Note: The data shown in this table are for demonstrative purposes only and should not be used for further reporting or calculations.

- **RefSource_Description** - Reference Source Description. Description of the data source.
- **Bibliography** - Bibliographic citations for the data source.
- **Source** - Agency and/or individual from which the data originated. This may be the laboratory, a contact within an organization, another database, or the primary publication cited as a source within the referenced publication.
- **Electronic** - A check field to indicate that the data source is available electronically.
- **Electronic-Filename** - Reference to the specific name of the electronic file.

2.7 Domain Tables

Thirteen domain tables have been created primarily for the purpose of database maintenance. These tables have several additional uses aside from data entry and modification applications. Eleven of the domain tables are linked directly to corresponding fields in the main data tables, as described earlier in this report. The remaining two domain tables are qualitative in nature and are intended to give the user a better understanding of data reporting conventions and the type of data available in the database.

2.7.1 Constraining Domain Tables

Constraints have been established for the links between the data tables and the domain tables ([Table 2-7](#)). These constraints require inclusion in the appropriate domain table before a value, code, or reporting name can be entered in the main data tables. By requiring consistency between data fields in the main data tables and the domain tables, reporting and format inconsistencies have been eliminated from the database.

Before new data are entered into the database, parameter names, reporting units, analytical procedures, DDF and DEF comment codes, and sampling locations are reconciled between the constraining domain tables and the corresponding data table. In the interest of preserving original data, new data items that cannot be reconciled with existing reporting conventions are used to update the domain tables accordingly. Descriptions of each of the constraining domain tables and their relationships to the main data tables are summarized in the following sections.

Table 2-7
Constraining Domain Table Constituents

Domain Table	Imposed Constraint	Main Data Table	Constrained Field
dmnParm	Ensures formatting consistency among the reported parameter names	tblSampleResults	Parm
dmnUnit	Ensures appropriateness and formatting consistency of reported units	tblSampleResults	Unit
dmnProceduresComments	Ensures appropriateness and formatting consistency for analytical procedures, methodology, and parameter codes	tblSampleResults	Procedure
dmnDocumentationQualifiers	Lists the numerical data documentation flag-codes and describes the established criteria for assigning them	tblSampleRefs	DDF
dmnEvaluationQualifiers	Lists the codes used as data evaluation flags and provides descriptions of the rationale used to assign them	tblSampleRefs	DEF
dmnQualifierComments	Provides detailed definitions of specific data qualifiers	tblSampleResults	Q
dmnParmCategory	Ensures appropriateness and formatting consistency of Parameter categories.	tblSampleResults	Category ID
dmnSampleMethodCodes	Lists the codes used to describe sample collection methodology	tblSampleData	S_Method
dmnSampleTypeCodes	Lists the codes used to describe sample types	tblSampleResults	S_Type
dmnDDFCommentCodes	Lists the codes and comments associated with the DDF Qualifiers	tblSampleResults	DDF Comment
dmnDEFCommentCodes	Lists the codes and comments associated with the DEF Qualifiers	tblSampleResults	DEF Comment

2.7.2 Additional Domain Tables

The *dmnParmUnitProcedure* table lists a unique combination of fields from the *tblSampleResults* table. It was created for the explicit purpose of showing the user what types of data are available. Specifically, the table shows what type of analytical results are available, how they are reported, and how they were analyzed. Because this table lists different combinations of information from the *tblSampleResults* table, none of the fields within this domain table contain unique information, which excludes this table from use as a constraining domain table. The final domain table is the *dmnTableInformation* table, which provides a reference of available information within the database by summarizing table descriptions and detailing table contents.

2.8 Comment Tables

Two comment tables have been created within the database. The *tblSampleLocComment* table elaborates and provides detailed descriptions of the abbreviations used in the "Coordinate Origins" field of the *tblSampleLoc* table.

The *tblSampleResults-Calculations* table describes the rationale behind including calculated or converted data results in addition to the formulas used to convert from originally reported units.

2.9 Database Logbook

The *lgbkEntries* table is used to document any additions, deletions, or modifications to the database. The logbook documents database activities since 1998. The first field, "ID," assigns a sequential value to each of the logbook entries. The next three fields track the database activity dates, the individual(s) responsible for the modifications, and the agency with whom they are affiliated. The following three fields use numerical codes for describing the nature of changes made and the tables affected by the particular database activity. The *lgbkEntries* table is linked to three supporting tables (i.e., *lgbkCodeDataChange*, *lgbkCodeDataStructureChange*, and *lgbkCodeTableChange*), which provide explanations for these numerical codes. The final field provides a detailed description of the database activity.

To make utilization and review of the logbook more efficient, entries are viewed using a query named "New Logbook Entry." This is an updatable query that displays the main logbook table and all three of the supporting logbook change-code tables. Because this query displays all of the change descriptions and comments at one time, it is recommended for monitoring recent database activities.

A printable report titled "rptlogbook" is also available in GeochemXX.mdb. This report summarizes all database maintenance activities. This logbook is available through either the **Reports** option in the *Database Window* or by using the *Navigation Menus* within GeochemXX.mdb. These options are described in [Section 3.0](#).

3.0 Database Installation and Navigation

Recognizing that not all potential database users are proficient in the application of querying capabilities within Microsoft Access®, the database has been distributed with a series of forms (front ends) for facilitating navigation through, and extraction from, the primary data and domain tables within the database. This section offers an overview of the front-end capabilities and provides detailed instruction as needed for ensuring effective and successful navigation of the database.

3.1 *GeochemXX.mdb* Installation Instructions

- 1.) Save the Microsoft Access® file, **GeochemXX.mdb**, to a directory with both read and write access (e.g., a personal computer hard drive or a user-accessible network drive).
- 2.) Open up Microsoft Explorer® or file manager and locate the **GeochemXX.mdb** file.
- 3.) Select the **GeochemXX.mdb** file. Access the file *Properties* by right-clicking on the **GeochemXX.mdb** file. Alternatively, single-click on the **GeochemXX.mdb** to make it selectable, then left-click on *File* on the menu bar at the top of the screen. Scroll down and left-click on *Properties*.
- 4.) Select the *General* file properties tab. File access attributes are displayed at the bottom of the *General* file properties tab.
- 5.) Remove the check mark from the *Read-Only* attribute check box and click the *Archive* check box. This will enable write/rewrite capabilities within the **GeochemXX.mdb** file, and is necessary for proper operation of the database navigation menu items.
- 6.) The remaining documentation files on the distribution CD can be opened directly from the CD, or from a user accessible hard drive or network drive, using Adobe Acrobat® Reader. Acrobat® Reader is available as a free download from the Adobe website, <http://www.adobe.com>.

3.2 Start-Up Navigation and Available Menu Options

Upon opening the database, the user will be presented with a switchboard listing the available menu options (Figure 3-1). The switchboard serves as the control center for all of the front-end applications. Selecting a button on the main switchboard takes the user automatically to a form for the associated task.

Figure 3-1
Switchboard Option Menu

The menu options available within **GeochemXX** are:

Query for Geochemical Data – This option enables the user to conduct a query of the primary data tables coupled with a capability of viewing and exporting datasets in a variety of formats.

Reference and Data Source Information – This option allows the user to view reference and data source descriptions, in addition to documentation and evaluation criteria assessments for individual sources. Moreover, the capabilities exist to view individual datasets attributed to each of the unique referenced data sources in either a *record* or a *cross-tabular* format.

Generate a Time-Series Concentration Plot – This option provides the user with the capability of viewing temporal concentration data, based on one of three search/display formats:

- Single Location – Single Parameter
- Single Location – Multiple Parameter
- Multiple Location – Single Parameter

Well and Spring Location Information – This option allows the user to view geographical information for sample locations. Information regarding ongoing location reconciliation processes are also included.

Data Management and Documentation – This option allows the user to view the database logbook, domain tables, and other data documentation forms.

Detailed instructions for using each of these menu options are included in the sections that follow.

Once the user is directed to the form associated with each of the main menu options, return access to the main switchboard can be achieved by selecting the **Return to Main Navigation Menu** button located at the bottom left-hand corner of each option-form.

For those with a working familiarity with Microsoft Access[®], and for those who have become accustomed to using earlier versions of the database, navigation of the objects within the database can be conducted through the *Database Window* (Figure 3-2). The *Database Window* can be viewed at anytime, simply by pressing the **F11** key on the keyboard or by selecting the link on the bottom of the navigation menu. The *Database Window* organizes and displays the database objects in tabular panes and provides an alternative means for navigating through the database objects. A separate pane exists for Tables, Queries, Forms, Reports, Pages, Macros, and Modules. Within each pane, individual database objects can be opened for viewing or modification (Figure 3-2).

3.3 Querying for Geochemical Data

The *Query for Geochemical Data* option provides the user with the capability of querying for comprehensive geochemical datasets using a limited and basic search criterion. Following selection of this option, the navigation window will be updated to the form shown in Figure 3-3. The predesigned geochemical data query offered through the navigation forms is completed through a series of four steps:

Step 1. Define Location Criteria. Five options are available for the selection of locations to be included in the query (Figure 3-3):

- **Select From List of All Site Names** - Allows for the selection of a maximum of four locations from a list of all sample locations included in the database.
- **Select From List Grouped by Site Type** - Allows for the selection of a maximum of four locations from a list of specific types of locations (Surface Water, Ground Water, or Precipitation Stations).
- **Select From List Grouped by Region** - Allows for the selection of a maximum of four hydrographic regions.
- **Use Coordinate Boundaries** - Allows for a query of sample locations within a specified range of boundaries.
- **Keyword Search on Site Name** - Allows for a query of locations based on a specific keyword.

Left-clicking on the first option, *Select From List of All Site Names*, will update the navigation window to include a list of sample location Site IDs as shown in [Figure 3-4](#). Up to four selections can be made. To select more than one location, simply select the first location, hold down the *Ctrl* key, then select the next desired location.

Selection of *Use Coordinate Boundaries* allows the user to enter a range of coordinates in one of three coordinate systems (Decimal Degrees, Nevada State Planar, and Universal Transverse Mercator [Figure 3-6]). Decimal degrees are the common reporting coordinate within GeochemXX.mdb. Selection of decimal degrees will therefore result in the most complete set of query results.

Figure 3-3
Query for Geochemical Data Form

Figure 3-4
Location-Based Query Form

Figure 3-5
Query Based on Site Type

Figure 3-6
Query Based on Coordinate Boundaries

Selection of *Keyword Search on Site Name* allows for a query of sample locations or a group of similarly named locations based on a user-defined keyword. As shown in [Figure 3-7](#), a keyword as well as an operator is entered. Users are given the capability of using one of three operators: “LIKE,” “NOT LIKE,” or “=”. The asterisk (*) should be used as a wildcard when qualifying the location search criteria with either “LIKE” or “NOT LIKE.” Conversely, when using the “=” qualification, the user must type in the Site_ID exactly.

Figure 3-7
Query Based on Site Name Keyword

Following the completion of Step 1, select **OK**.

Step 2. Define Date Criteria. Three options are available for the selection of sample dates to be included in the query ([Figure 3-8](#)).

- **Search for All Sample Dates** - Query results will list data for all sampling events associated with the location(s) and parameter(s) established in the search criteria. Choosing this option will not establish a limiting search criteria based on sample collection dates.
- **Select from a List of Sample Dates** - The user has the capability of selecting up to four specific sampling dates from the scrolling list box.
- **Specify a Range of Sample Dates** - The user has the capability of searching for data from a particular time period. Query results will list data for samples collected AFTER a certain date, BEFORE a certain date, or a combination that bounds the search to data collected within a specific time interval.

Figure 3-8
Define Date Criteria

Choosing either *Select from a List of Sample Dates* or *Specify a Range of Sample Dates* will update the navigation window to include a list of all sample dates available within the database. When you choose to specify a range of sample dates, you will be allowed the entry of a range of sample dates (Figure 3-9).

Following the completion of Step 2, select **OK**.

Step 3. Define Parameter Criteria. Three options are available for parameter selection (Figure 3-10).

- Select From a List of All Parameters
- Select From a Group of Parameters
- Keyword Search on Parameter Name

Selecting one of the first two options will update the screen to include a list of all parameters available, with the exception of colloids, within the database. An additional box, *Parameter Groupings*, is shown when the *Select From a Group of Parameters* option is selected (Figure 3-11). This box contains a list of the eight available categories of parameters. The *Select From a Group of Parameters* option is required to update the parameter list to contain colloid data. Upon selection of one of the categories, the parameter list will be updated to include only the parameters within the specific category. The user is then allowed to select up to four parameters from the list. To select more than one parameter from the parameter list, left-click on the first parameter, hold down the *Ctrl* key, then click on the next desired parameter.

Figure 3-9
Define Date Criteria Including List of Sample Dates

Figure 3-10
Define Parameter Criteria

Figure 3-11
Define Parameter Criteria Including Parameter Groupings

In addition to the list box selections, a user-defined keyword search criteria can be used to search for a particular parameter or a group of similarly named parameters. The **Keyword Search on Parameter Name** option is performed identically to that for the location site names. The three operators ("LIKE," "NOT LIKE," and "=") can be used to select parameters that contain the keyword, do not contain the keyword, or are identical to the keyword, respectively.

Select **OK** following the completion of Step 3.

Step 4. Submit Query. Once the user is satisfied with the defined search criteria, the user clicks on the *Submit Query* button to execute the query. Microsoft Access® will run the query and return a dataset matching the search criteria. Two options will be presented for viewing the dataset in a *cross-tabular* format. The user is given the option of including the reference and procedural information with the query results. The *cross-tabular* format groups parameter, value, and unit information into columns, with a separate column for each analysis (Figure 3-12).

The user is also provided with the option to **Open Advanced Query Design** and **Open the Query Data Form Tutorial**. These options may be selected from the bottom of the *Query for Geochemical Data* form. These options allow the user to view the tutorials that are available within GeochemXX.mdb and prepare an advanced query design.

Figure 3-12
Available Options for Viewing the Query Results

The tutorials that are available within the *Query for Geochemical Data* form (Figure 3-13) consist of a series of forms that offer a general overview for navigation of each screen and detailed instructions for developing specific search criteria for each of the available search conditions. Additionally, tips for creating and defining feasible search criteria and generating successful datasets are available throughout the tutorial.

For those with a working familiarity with the development of search criteria and database navigation through the *Database Window* panes, clicking on the **Open the Advanced Query Design** button will open the select-query object, *qryAdvanced*, in the design mode (Figure 3-14). Execution and navigation of query options in the advanced query window of the *Query for Geochemical Data* form are no different from normal operation of queries conducted through the *Database Window*. This select-query has been predesigned to include the four primary data tables and is intended to act as a starting point for those wishing to generate a complete dataset using more advanced search capabilities. Within the design view of *qryAdvanced*, additional search criteria can be defined for categories such as sample type, data value qualifiers, procedural or parameter code information, and/or information pertaining to referenced data sources. Once the user is satisfied with the search criteria that is defined, the user clicks “!” on the Microsoft Access® toolbar to run the query. The query will return a dataset matching the search criteria. The dataset will be displayed in the default *record* format – one analysis, parameter, value, unit, and procedure per row.

Figure 3-13
Query Data Form Tutorial

Figure 3-14
Advanced Query Design

3.4 Reference and Data Source Information

This menu option provides the user with the capability of viewing reference and data source descriptions in addition to documentation and evaluation criteria assessments for individual data sources. Moreover, the *Reference and Data Source Information* form offers the capability to view individual datasets attributed to each of the unique referenced data sources in either a *record* or a *cross-tabular* format. Selection of this option reveals the form shown in Figure 3-15.

U.S. Department of Energy
Geochemistry Database of Groundwater
at the Nevada Test Site and Vicinity

National Nuclear Security
Administration

Browse through Data-Source Information

Select a Reference:

- Bechtel Electronic
- DRI (04/21/98 Pers. Comm.)
- DRI (1997 Pers. Comm.)
- DRI (1998 Pers. Comm.)
- DRI data package
- DRI Electronic
- DRI FAX transmittal
- DRI Letter (01/29/96)
- DRI Letter (03/12/97)

Select from Source(s):

Source	REF_ID
Chuck Russell (DRI Memorandum)	3

You must select both a Reference and a Source in order to view the pertinent Data-Source Information

In order to view pertinent information about a data source, the user must first select an entry from both of these list-boxes.

February 24, 2004

Return to the Main Navigation Menu
 Close Database and Exit Application
 Open Database Window

Figure 3-15
Reference and Data Source Information

Navigation of this form is relatively straightforward. Simply scroll through and select from the list of references, then select from the corresponding list of data sources attributed to the selected reference. Once a *Reference* and a *Source* have been selected, bibliographic description information will be displayed automatically at the bottom of the form. A tab box will also appear at the bottom of the form summarizing the pertinent information for the selected data source (Figure 3-16).

If the user would like to view the actual dataset, as it exists within the database, attributed to the selected data source, simply click on the **View Data** tab and two options will be presented for viewing the data. The user will be given the option to view the data in a record format or a cross-tabular format. Simply click on the button to the left of the desired viewing option, then click on the **View Data** tab. Microsoft Access® will query the dataset and display it in the manner indicated (Figure 3-17).

Figure 3-16
Viewing Reference and Available Data Source Information

3.5 Generating a Time-Series Concentration Plot

This menu option provides the user with the capability of generating a dataset viewable as a temporal plot of geochemical concentrations using one of three search/display formats, including:

- *Single Location – Single Parameter*
- *Single Location – Multiple Parameter*
- *Multiple Location – Single Parameter*

Navigation of the *Generate a Time Series Concentration Plot* form (Figure 3-18) is relatively self-explanatory. The user simply develops a search criterion by making selections from each of the search controls on the form.

Step 1. Select the Chart-Type. In addition to qualifying the dataset and determining the graph's display format, this will determine what additional options will become available as described in the following steps.

If one of the *Single Location* chart-type options is selected, the user will only be able to highlight one location from the list. Enabling the *Multiple Location* chart-type option will allow the user to select up to four locations from the list. If one of the *Single Parameter* chart-type options is selected, the user will only be able to highlight one parameter name from the list. Enabling the *Multiple Parameter* chart-type option will allow the user to select up to four parameter names from the list.

Selecting the **View Data** tab will present the available source data viewing options.

Indicate the data viewing preference and select the **View Data** button.

Cross-Tabular Format

Record Format

MASTER ID	SITE ID	S Date	A Date	S Type	Ba, Dissolved	Be, Dissolved	Ca, Dissolved	Cl, Dissolved	Cl, Dissolved
373214115441901	April Fool Spring	19911218			0.046 mg/L	< 0.001 mg/L	78.6 mg/L	< 0.005 mg/L	15.6 mg/L
Virgin River, Beaver Dam Wash	Beaver Dam Wash (Stream Flow)	19920722			0.06 mg/L	< 0.001 mg/L	86.4 mg/L	< 0.005 mg/L	35.2 mg/L
Snake_Big	Big Spring, Snake Valley	19920619			0.118 mg/L	< 0.001 mg/L	46.6 mg/L	< 0.005 mg/L	5.1 mg/L
382748115472401	Chimney Hot Spring Province, 07N55E-	19920512			0.234 mg/L	< 0.001 mg/L	68.3 mg/L	< 0.005 mg/L	11.1 mg/L
362620115212601	Cam Creek Springs, 17S59E-34abb	19920305			0.067 mg/L	< 0.001 mg/L	45.8 mg/L	< 0.005 mg/L	6.1 mg/L
362502116192301	Crescent Spring	19911218			0.173 mg/L	< 0.001 mg/L	93.6 mg/L	< 0.005 mg/L	10.7 mg/L
373153115136801	Crystal Pool	19920317			0.065 mg/L	< 0.001 mg/L	46.2 mg/L	< 0.005 mg/L	23.7 mg/L
365711115115101	Crystal Spring	19920512			0.083 mg/L	< 0.001 mg/L	44.7 mg/L	< 0.005 mg/L	8.8 mg/L
362530116173001	Desert Valley (Dry Lake) Well #1	19920607			0.076 mg/L	< 0.001 mg/L	20.1 mg/L	< 0.005 mg/L	8.4 mg/L
362530116173001	Devils Hole	19920709			0.08 mg/L	< 0.001 mg/L	48.6 mg/L	< 0.005 mg/L	20.7 mg/L
362924116203001	Fairbanks Spring	19920317			0.096 mg/L	< 0.001 mg/L	48.1 mg/L	< 0.005 mg/L	21.4 mg/L
373654115125201	Hiko Spring, 4S60E-14dbab1	19911218			0.113 mg/L	< 0.001 mg/L	47.1 mg/L	< 0.005 mg/L	9.4 mg/L
White River_Hot Creek	Hot Creek Spring, White River Valley	19920520			0.116 mg/L	< 0.001 mg/L	57.5 mg/L	< 0.005 mg/L	9.6 mg/L

MASTER ID	SITE ID	SAMPLE ID	S Date	A Date	S Type	PARAM	Q	VAL	UNIT	PROCEDURE
373214115441901	April Fool Spring	4339	19911218			Ba, Dissolved		0.05 mg/L		EPA 208.1 and 2C
373214115441901	April Fool Spring	4339	19911218			Be, Dissolved	<	0.001 mg/L		Not Available
373214115441901	April Fool Spring	4339	19911218			Ca, Dissolved	<	0.005 mg/L		Not Available
373214115441901	April Fool Spring	4339	19911218			Cl, Dissolved	<	0.01 mg/L		Not Available
373214115441901	April Fool Spring	4339	19911218			Co, Dissolved		0.005 mg/L		Not Available
373214115441901	April Fool Spring	4339	19911218			F, Dissolved		0.6 mg/L		EPA 340.2
373214115441901	April Fool Spring	4339	19911218			Fe, Dissolved		0.16 mg/L		EPA 236.1 and 2C
373214115441901	April Fool Spring	4339	19911218			Li, Dissolved		0.03 mg/L		USGS 11425-85
373214115441901	April Fool Spring	4339	19911218			Mn, Dissolved		0.01 mg/L		EPA 243.1 and 2C
373214115441901	April Fool Spring	4339	19911218			Mo, Dissolved	<	0.01 mg/L		EPA 246.1 and 2C
373214115441901	April Fool Spring	4339	19911218			NO3, Dissolved		0.31 mg/L		Not Available
373214115441901	April Fool Spring	4339	19911218			Pb, Dissolved	<	0.001 mg/L		EPA 239.1 and 2C
373214115441901	April Fool Spring	4339	19911218			SiO2, Dissolved		27.7 mg/L		Not Available

Figure 3-17
Options for Viewing the Data Associated with the Selected Reference and Data Source

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Geochemistry Database of Groundwater
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Charting Option Page

1. Chart-type

- ☒ Single-location/single-parameter
- ☐ Single-location/multiple-parameter
- ☐ Multiple-location/single-parameter

2. Non-detects

- ☒ Plot non-detects as zero
- ☐ Plot <'s as half the detection limit
- ☐ Ignore non-detects

3. Select by

- ☒ Location
- ☐ Parameter

4. Location(s)

MASTER_ID	SITE_ID
125/47-7dbd	125/47-7dbd
361735116500001	195/53E-21a
361909116013401	195/53E-9b
354053116251701	354053116251701
354437116580000	354437116580000
7200001	7200001

5. Category

- ☒ Minor and Trace Constituents
- ☐ Major Constituents
- ☐ Environmental Isotopes and Tracers
- ☐ Radionuclides
- ☐ Organics and Hydrocarbons
- ☐ Physically Field, and Miscellaneous

6. Parameter(s)

- Al, Dissolved
- F, Dissolved
- Fe, Dissolved
- Li, Dissolved
- Mn, Dissolved
- NO₂+NO₃, Dissolved
- Orthophosphate, Dissolved
- SiO₂, Dissolved
- Sr, Dissolved

7. Units

8. Plot

December 23, 2005

Return to the Main Navigation Menu
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Open Database Window

This database does not have the capability of plotting data with *mixed* units (e.g., pCi/L and °C) on the same time-series graph.

Presently, all data have to be plotted on the same y-axis.

In order to plot the data, Microsoft Access® has to convert everything to common units. If no such data conversion factor exists, Microsoft Access® cannot generate a time-series plot.

Figure 3-18
Generating a Time-Series Concentration Plot

Step 2. Determine How Nondetects Should Be Displayed on the Graph. Nondetects may be displayed as zero, half the detection limit, or simply ignored.

Step 3. Select by Location or Parameter. Choose whether to select by location or by parameter. Choosing to select by location will provide the location list and display parameters available for the location(s) selected. Choosing to select by parameter will provide the parameter list and display locations with data available for the parameter(s). In order to make multiple selections from the list of locations, click on the first location, press the *Ctrl* key on the keyboard and continue making selections. Locations are organized alphabetically according to "Site_ID."

Step 4. Select from a Grouping of Parameters according to the *Category* descriptions to see a unique list of corresponding parameters.

Step 5. Select a Parameter, or parameters, from the list. In order to make multiple selections from the list, click on the first parameter name, press the *Ctrl* key on the keyboard, and continue making selections. Parameter names are organized alphabetically.

Step 6. Determine the Unit To Display the Data in a Graph. By selecting a unit from the list, the user provides Microsoft Access® with a means for converting data values as appropriate to match the selection. The current release of this form does not have the capability of plotting data with *mixed* units (e.g., picocuries per liter [pCi/L] and degrees Celsius [°C]) on the same time-series

graph. All data must be plotted on the same y-axis. In order to plot the data, Microsoft Access[®] has to convert everything to common units. If no such conversion factor exists, Microsoft Access[®] cannot generate a time-series plot. Therefore, the user should avoid selecting multiple parameters for which there is no common reporting convention (e.g., temperature and radium-226). While the categorization of parameters has eliminated the occurrence of many of the incompatible reporting conventions, some incompatibilities still exist. Most of these can be avoided by relying on the user's knowledge and reasonable expectations for data reporting and graph-display conventions.

Step 7. Execute the Query. Once the data search criteria is complete, click on the *Plot* button in order to execute the query. Microsoft Access[®] will compile the dataset and display the data graphically on one of three graphs, depending on the *Chart-Type* selected in Step 1 (Figures 3-19, 3-20, and 3-21).

When initially displayed, a tabular form of the dataset that is generated by the query is contained in a minimized window at the bottom-left corner of the screen. The source of the graphed data are contained within this minimized window (*qrytsconplotdata*) and can be scrutinized by maximizing the query object. The graph is displayed with a default range and scale of sampling dates along the x-axis. If the data are plotted on either side of this range of sampling dates, the x-axis will need to be modified in order to view all of the data.

Figure 3-19
Time-Series Concentration Plot Single Location, Single Parameter

Figure 3-20
Time-Series Concentration Plot Single Location, Multiple Parameter

Figure 3-21
Time-Series Concentration Plot Multiple Location, Single Parameter

Microsoft Access® relies on Microsoft Graph® for the plotting capabilities offered by the *Generate a Time-Series Plot* form. While the Microsoft Graph® capabilities are limited in some respects (e.g., automatic axis ranges, multiple axis graphing) it does offer familiarity to users that are comfortable with the graphing capabilities of Microsoft Excel®.

In order to modify the graphic display of data, the objects within the graph must be made selectable. This is accomplished by simply double-clicking on the graph itself. Once the graph objects are selectable, the user can right-click on objects within the graph, at which time a number of editing options will be presented.

For example, right-clicking on the outer edge of the chart will present options to *Format Chart Area...*, change the *Chart Type...*, or modify the *Chart Options*. Selecting *Chart Options* will enable the user to add/edit titles, modify the axis ranges, reformat gridlines, change the display of the data legend, and add data labels ([Figure 3-22](#)).

Any time another search is executed when plotting data, the modifications made to the graphical display will be overwritten. In order to avoid losing the graph display modifications, the user must save the modified chart under a different name.

Figure 3-22
Modifying Chart Display Options

3.6 Well and Spring Location Information

This menu option provides the user with the capability of viewing the geographic coordinate information and any location reconciliation comments pertaining to the listing of available well and spring locations. Operation and navigation of the *Well and Spring Location Information* form is relatively self-explanatory. Available selection options and their resulting operation are illustrated in (Figure 3-23).

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National Nuclear Security Administration
NSA

Browse through Well and Spring Location Information

Available Location Names

SITE_ID	MASTER_ID
Airport Well, 15S/49E-24abb	363830116241401
Alamo City Well #7	Alamo City Well #7
Albert Spring	363406115214201
Albitre Well (formerly Theide's Well), 516/49E-16	363320116280900
Algiers Hotel Pool, 21S/61E-09-1	360800115093000
Alkali Spring	Alkali Spring
Alum Spring	Alum Spring

Database Coordinates

Latitude-DEC: 36.6403
Longitude-DEC: 116.4092

Alternate or Originating Coordinates:

Lat-DMS	Long-DMS	STP-North	STP-East	UTM-North	UTM-East
36° 38' 25"	116° 24' 33"	688113.64129	575544.47729	4054928.96678	552817.88072

Location Comments:

Data were updated from Rev 6 of the borehole index.

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[Return to the Main Navigation Menu](#)
[Close Database and Exit Application](#)
[Open Database Window](#)

Selecting a well or spring location from the list of Available Location Names will generate the available geographical information and any location reconciliation comments for the selection.

Figure 3-23
Browsing Well and Spring Location Information

3.7 Data Management and Documentation

The *Data Management and Documentation* form allows the user to browse database documentation and domain tables. These options are shown in Figure 3-24 and are described within this section.

Browse Database Documentation - Selection of this option provides three choices to the user (Figure 3-25):

- View a Summary of Table Contents
- View All Entries from the Database Logbook
- ***Return to the Previous Menu***

Selection of *View Summary of Table Contents* will update the screen to the *Table Summary and Data Field Information* form shown in Figure 3-26. This form

Figure 3-24
Browse Database Documentation and Domain Tables

allows the user to select a specific table and field within that table. A short description is presented.

Selection of *View all Entries from the Database Logbook* enables the user to view a list of data additions, data deletions, and any modifications made to the database since June 1998 (Figure 3-25). At present, the logbook entries are not searchable using this menu option. The user will be able to scroll through the pages of the report using the navigation controls in the lower left-hand corner of the report window. Logbook entries are organized according to the date in which they were made. This option is illustrated in Figure 3-25.

Browse Domain Table - Selection of this option provides five choices to the user (Figure 3-27):

- Parameter, Unit, and Procedural Information
- View Qualifier Information
- View Procedural Information
- DEF and DDF Qualification Criteria
- Return to Previous Menu

Parameter, Unit, and Procedural Information - Provides available procedural information within the database. Operation and navigation of the *Parameter, Unit, and Procedural Information* form is relatively self-explanatory. Available selection options and their resulting operation are illustrated in Figure 3-28.

D. I. C. L. C. C. T. H.

View Procedural Information - This menu option provides the user with the capability of viewing full methodology citations for all of the analytical procedure and parameter codes used in the database. Upon making a selection from the *Procedure* list, the *Procedural Information* form will display a complete explanation, where available, of the selected procedure (Figure 3-30).

Figure 3-26
Table Summary and Data Field Information

Figure 3-27
Viewing Domain Tables

Figure 3-28
Parameter, Unit, and Procedural Information

Figure 3-29
Viewing Qualifier Information

Figure 3-30
Browsing Procedural Information

Figure 3-31
Data Documentation and Data Evaluation Flag Descriptions

3.8 Summary

GeochemXX.mdb was designed to provide the user with the capability to search for comprehensive geochemistry data in a user-friendly style. Switchboards were generated to logically navigate the user through this process. Pre-designed queries have been built into the database while allowing flexibility to the user to search on a variety of different objects (measured parameters, sampling locations, as well as sampling dates). In addition to the query capabilities built into the database, a high level of documentation associated with the database building process has been maintained and is readily accessible to the user. Domain tables have been generated to provide the user with descriptions of all data, qualifiers, and codes contained within the database.

GeochemXX.mdb is continually being updated and is released annually. Each annual update will provide the user with newly acquired data, additional historical data, as well as improvements through sample/sample location reconciliation processes.

4.0 Data Sources and the Quality Control Program

Data electronically transmitted from the USGS, DRI, EPA, Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Reynolds Electrical & Engineering Co., Inc. (REECo), Bechtel Nevada (BN), U.S. Air Force (USAF), IT Corporation (IT), Stoller-Navarro Joint Venture (SNJV), and the Harry Reid Center for Environmental Studies (HRCES) constitutes the majority of data found in the database. The remainder of the data originates from published literature and a variety of data generated in support of the NNSA/NSO. Full citations of the published data sources are listed in the reference section of this report. Discriminating reference and source names have been assigned to the digital and unpublished data sources and are reported, along with the data source, in a table (*tblSampleRefs*) that is linked to their corresponding analytical results (*tblSampleResults*).

When new data are received, they are first reviewed for quality and completeness. If deemed appropriate for inclusion in the database, the database is examined to ensure that the data have not been entered through another referenced source. Electronic and hand-entered data are first compiled into a working data file where location, parameter, and procedure information is reconciled for consistency with existing text and data formats from the main data tables in the database. The working data files are then returned to the data source for final verification before importation into the database. The data are also checked against the existing domain tables and appropriate modifications are made before the new data are appended to the main data tables. The working copy is then stored in an external location so that it can be used to recreate the data reference if necessary. After the data are included in the main data tables, specified queries, designed to extract the new data, are run. Once extracted, the data are then compared with the original data source, the working copy is modified as necessary, and the process is repeated until all errors are eliminated from the working copy.

Each results record is assigned a DDF indicative of the level of documentation available for the data. The DDF is implicitly based on the data source, quality assurance procedures in place at the time of data collection, and the availability of supporting documentation. Similarly, each record is also assigned a DEF indicative of the consistency of the data. Comments supporting the rationale behind the assignment of these data flags are added as needed. The data flags correspond to each results record in the *tblSampleResults* table and therefore describe the availability of documentation and data quality for each chemical parameter (Section 2.3). The established criteria for each of the flags are summarized in their corresponding domain tables, *dmnDocumentationQualifiers* and *dmnEvaluationQualifiers*.

4.1 Editing and Reconciliation Procedures

This database was created in 1994 and maintained in a flat-file format. Essentially, all of the data were contained in a single table. As the database grew, it became more efficient to maintain and control data entry in a relational-table format. Accordingly, the flat-file database was separated into the four main data tables and linked together using unique data control fields (e.g., “Master_ID,” “Sample_ID,” “Ref_ID”). In the transition from the flat-file format to the relational format, some data records may have been inadvertently altered in the process. A verification program was implemented in order to evaluate the effectiveness of this transition. This program included a qualitative and quantitative review of the following data:

- Verification of *Resource Conservation and Recovery Act* (RCRA)-regulated metals against the original data sources
- Verification of radionuclides against the original data sources
- Verification of isotopes against the original data sources
- Systematic manipulation of the data to identify anomalous values within the database, followed by appropriate verifications against their original data sources

All systematic data manipulation has been completed. Verification of RCRA-regulated metals, isotopes, and radionuclides are in various stages of completion. Significant efforts during the 2005 fiscal year were placed on verifying data in participation with the USGS, DRI, LLNL, and BN. Modifications to the data that have taken place during this process have been logged in the *lgbkEntries* table. Information regarding data documentation and quality is presented using DDFs and DEFs.

As part of the transition to a relational-table format, the supporting domain tables were created. These tables represent unique listings of certain data fields and are used for data control and data extraction purposes ([Section 2.7](#)). Before these tables could be established as controls for data entry, it was necessary for the database to undergo a process of name reconciliation. The reconciliation process resulted in a number of text-formatting changes to standardize the “Site_ID,” “Parm,” and “Procedure” fields. In addition to establishing consistent reporting formats within the database, this process resulted in the identification and elimination of a considerable amount of duplicated data. It is important to note that these text-format changes have not significantly altered the data within the database. All of the data records can still be traced back to their original data source.

4.2 Database Limitations

As with most databases of this sort, the use of multiple and historical data sources have given rise to some inherent data limitations. Water sampling, analytical, and reporting methodologies are typically tailored to specific objectives. These objectives and methodologies can occupy a broad range of possible alternatives that change as a function of program goals and the tools available. The identification of key water quality parameters and the capability to detect them at significant concentration levels is an evolutionary process. Data documentation and qualification are also dependent on the context in which the samples were collected. The data contained in the database come from diverse sources and were generated over a period of time for a wide range of purposes. Therefore, inconsistencies are common in the original data. The establishment and utilization of the DDF and DEF qualification criteria can be used to identify many of the generalized inconsistencies between data sources. The data user is urged to take the DDF and DEF qualifiers under advisement when evaluating data from multiple sources.

There are a few inconsistencies in the reporting of data that have been maintained for many of the older data sources. For instance, it has not always been explicitly stated that reported concentrations represent dissolved ion concentrations. Because it is impractical to verify all of these data entries, and in the light of inconsistencies in historical data reporting conventions, it was assumed that all reported concentrations represent dissolved constituents unless otherwise noted in the original reports. Similarly, the distinction between field and laboratory measurements for pH and the differentiation between the types of inorganic carbon analyses (bicarbonate, carbonate, total dissolved inorganic carbon, and alkalinity) is not always clear. If there was uncertainty associated with the reconciliation of locations, parameter names, units, or procedures, the original reporting convention was incorporated as the default condition into the database. As a consequence, this may have given rise to the occurrence of duplicate data. A concerted effort was made to eliminate duplicated information. Nonetheless, users are cautioned to exercise scientific judgment and familiarity with the region when using data in this regard.

As with most databases of this sort, the use of multiple and historical data sources has given rise to some inherent data limitations. The analyses presented are of variable quality and completeness, and data users are reminded to exercise judgment when using data in this regard. While every reasonable effort has been made to ensure completeness and accuracy, it is anticipated that database users will identify errors and omissions.

5.0 Summary

GeochemXX.mdb has been developed as part of the UGTA Program with the cooperation of several agencies participating in evaluation and characterization activities under contract to the DOE. The database has been constructed to provide up-to-date, comprehensive, and quality controlled data in a uniform format for the support of current and future projects. Annual updates will keep the database current with respect to ongoing data gathering activities. Posting the database on the CDR (DTN 884) will make the database available to all agencies with DOE intranet access.

Water quality data have been compiled for wells and springs at the NTS and the surrounding region. The data are available as a relational Microsoft Access[®] database. Updated versions of the database will be given titles indicative of their release date and will be accompanied by appropriate documentation, describing the differences between each version.

The database consists of six primary data tables: *tblSampleLoc*, *tblSampleData*, *tblSampleResults*, *tblColloidResults*, *tblNFTestsData*, and *tblSampleRefs*. These main data tables are supported by a variety of domain and comment tables. There are two types of domain tables, those which provide control over the entry and modification of data, and those which provide the user with a better understanding of data reporting conventions and the type of data sources available within the database.

Primary sources of data constitute electronic data transmittals from the USGS, DRI, LLNL, LANL, REEC, EPA, BN, USAF, SNJV, IT, and HRCES. Additional data sources include open publications and data communications in support of the NNSA/NSO programs.

Data reporting concerns arising from the conversion of the database from a flat-file format to a relational-data table format have been addressed through a separate QA/QC program. This program was supported by comprehensive verification for RCRA-regulated metals, radionuclides, and isotopes. Inconsistent data reporting identified during the verification program have since been corrected and documented.

Additional editing of the database has elicited a variety of text-format changes, most of which have been made in support of the various location-name, parameter, unit, and procedure information reconciliation. All of these editing activities have been described within the database itself. Appropriate changes and all QA/QC checkprinting documentation have been maintained separate from the database and in accordance with DOE or NNSA/NSO standard operating procedures.

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Data Correction / Transfer Contact Information:

Irene Farnham

Stoller-Navarro Joint Venture

7710 W. Cheyenne, Bldg 3

Las Vegas, NV 89129

(702) 295-3694

(702) 295-5393 (Fax)

Irene.Farnham@nv.doe.gov

John McCord

Stoller-Navarro Joint Venture

7710 W. Cheyenne, Bldg 3

Las Vegas, NV 89129

(702) 295-1881

(702) 295-5393 (Fax)

John.McCord@nv.doe.gov

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Mavrik Zavarin Lawrence Livermore National Laboratory P.O. Box 808, L-221 Livermore, CA 94551	1 (CD)
Ken Ortego National Security Technologies, LLC P.O. Box 98521 M/S NSF-082 Las Vegas, NV 89193-8521	1 (CD)
David Hudson National Security Technologies, LLC P.O. Box 98521 MS NTS-273 Las Vegas, NV 89193-8521	1 (CD)
Don Van Etten National Security Technologies, LLC Remote Sensing Laboratory Nellis Air Force Base M/S RSL-47 Las Vegas, NV 89191	1 (CD)

Ron Hershey Desert Research Institute 2215 Raggio Parkway Reno, NV 89512	1 (CD)
Jim Thomas Desert Research Institute 2215 Raggio Parkway Reno, NV 89512	1 (CD)
Chuck Russell Desert Research Institute 755 E. Flamingo Road Las Vegas, NV 89119-7363	1 (CD)
Zell Peterman U.S. Geological Survey 21 Center Ave Denver Federal Center Denver, CO 80225	1 (CD)
Jim Paces U.S. Geological Survey Denver Federal Center Box 25046, MS-963 Lakewood, CO 80225	1 (CD)
Tom Oliver U.S. Geological Survey Denver Federal Center Box 25046, MS-421 Denver, CO 80225	1 (CD)
Bonnie Thompson U.S. Geological Survey Water Resources Division 160 N. Stephanie St. Henderson, NV 89074-8829	1 (CD)
Dave Wood U.S. Geological Survey Water Resources Division 160 N. Stephanie St. Henderson, NV 89074-8829	1 (CD)
Irene Farnham Stoller-Navarro Joint Venture 7710 W. Cheyenne Las Vegas, NV 89129	1 (CD)

John McCord 1 (CD)
Stoller-Navarro Joint Venture
7710 W. Cheyenne
Las Vegas, NV 89193

Christie Miller 1 (CD)
Stoller-Navarro Joint Venture
7710 W. Cheyenne
Las Vegas, NV 89193

Manager, Northern Nevada FFACO 1 (CD)
Public Reading Facility
c/o Nevada State Library & Archives
100 N. Stewart Street
Carson City, NV 89701

Southern Nevada Public Reading Facility 1 (CD)
c/o Nuclear Testing Archive
P.O. Box 98521, M/S 400
Las Vegas, NV 89193-8521