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A USER'S GUIDE
to the
GEOTHERMAL RESOURCE AREAS DATABASE

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October 1981

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TABLE OF CONTENTS

1.	OBTAINING ACCESS TO SPIRES	1
1.1.	Obtaining an Account at Stanford	1
1.2.	Direct Dial Access to the Stanford Computer	1
1.3.	Telenet Access to the Stanford Computer	2
1.4.	Logging onto the Stanford Computer	2
1.5.	Helpful Documents	3
2.	OBTAINING REPORTS FROM GRAD	4
2.1.	General Instructions	4
2.2.	Arguments to Protocols	5
3.	INDIVIDUAL PROTOCOL DESCRIPTIONS	7
3.1.	Address List Report	7
3.2.	Geothermal Resource Area Status Report	9
3.3.	Resource Characteristics Report	13
3.4.	Lease Detail Report	15
3.5.	Lease Holder Summary Report	17
3.6.	Lease Summary Report	19
3.7.	State Summary Report	21
3.8.	Lease Holder Totals Report	23
3.9.	Well Detail Report	25
3.10.	Well Flow Report	27
3.11.	Well Drilling Data Report	29
3.12.	Well Footage Report	31
3.13.	Well Locations Report	33
3.14.	Well Names Report	35
4.	STRUCTURE OF THE DATABASE	37
4.1.	Data Elements	37
4.2.	Records	37
4.3.	Structures	39
4.4.	Geothermal Resource Areas	39
4.5.	Detailed Record Structure	40
5.	USING THE QUERY LANGUAGE	42
5.1.	The Query Process	42
5.2.	Selecting a Subfile	42
5.3.	Setting a Format	43
5.4.	Finding a Set of Records to Display	43
5.5.	Sequencing the Records	44
5.6.	Displaying the Results	44
5.7.	Controlling the Environment	44
	REFERENCES	46
	APPENDIX. GRAD RECORD DEFINITIONS	47
1.	ADDRESS Record	47
2.	AREA DESCRIPTION Record	48
3.	PERMIT Record	50
4.	LEASE Record	51
5.	WELL Record	53
6.	PLANT Record	56
7.	REFERENCE Record	58
8.	AREA SUMMARY Record	59

ABSTRACT

The National Geothermal Information Resource project at the Lawrence Berkeley Laboratory is developing a Geothermal Resource Areas Database, called GRAD, designed to answer questions about the progress of geothermal energy development. This database will contain extensive information on geothermal energy resources for selected areas, covering development from initial exploratory surveys to plant construction and operation. The database is available for on-line interactive query by anyone with an account number on the computer, a computer terminal with an acoustic coupler, and a telephone.

The database is described in another report. That report discusses the background of the project, conceptual development, software development, and data collection. Familiarity with the reference is not necessary to obtain reports or interrogate the database.

This report will help in making use of the database. We provide some information on obtaining access to the computer system being used, instructions on obtaining standard reports, and some aids to using the query language.

1. OBTAINING ACCESS TO SPIRES

Before using the GRAD database, it is necessary to obtain an account on the Stanford computer. After this has been done, it is possible to connect a terminal to the computer directly over the telephone, or via Telnet (a public network for data communications).

1.1. OBTAINING AN ACCOUNT AT STANFORD

You must fill out an Application Form and a Supplemental Application Form to establish an account at Stanford. These forms may be obtained by writing to C.I.T. Accounting, at the address given below. If you have any questions, call them between 9:30-12:00 am, or 1:30-5:00 pm, local time. Fill out the application, and mail it to C.I.T. Accounting.

The approved application will be returned to you, giving four codes: Group Code, User Code, Output Bin, and Initial Keyword. If you now call the GRAD staff at (415) 486-6871, or write to us giving these codes, we can help you set up your access to the system to simplify your use of the database.

The C.I.T. Accounting address is:

C.I.T. Accounting
Forsythe Hall
Stanford University
Stanford, CA 94305

(415) 497-4795

1.2. DIRECT DIAL ACCESS TO THE STANFORD COMPUTER

You must have a terminal with a coupler for a telephone receiver. Required characteristics of the terminal are as follows:

Standard ACSII character set (96 printing and 33 control characters)
Speed: 300 or 1200 baud (30 or 120 characters per second)
Communications mode: Half duplex (also known as full duplex with local copy)
Parity: Even

Call the computer at (415) 328-4000. If all goes well, one or two rings will be heard, the phone is answered, and you hear a high-pitched tone. At this point, the computer is ready for you to complete the connection - you have about 7 seconds to do this.

If there is no answer, the computer is not working - try again later. If you get a busy signal, no line is available at the computer. You must hang up and try again in a few minutes.

Place the telephone receiver into the terminal headset. Most terminal headsets have a diagram showing which cup should hold the end of the receiver that has the cord.

Wait for the connection to be established. This takes a few seconds. The terminal or headset should have a light that goes on when this connection is set. You are now connected - proceed to log onto the com-

puter, using the instructions given in Section 1.4.

1.3. TELENET ACCESS TO THE STANFORD COMPUTER

Terminal characteristics are as given in the previous section. Call the local Telenet access point. You may obtain a brochure from Stanford giving telephone numbers for many locations in the U.S. and Canada; other numbers can be obtained from any Telenet office. If all goes well, one or two rings will be heard, the phone is answered, and you hear a high-pitched tone. At this point, Telenet is ready for you to complete the connection - you have about 6 seconds to do so.

If there is no answer, Telenet is not working - try again later. If you get a busy signal, no line is available - hang up and try again in a few minutes.

Place the telephone receiver into the terminal headset. Most terminal headsets have a diagram showing which cup should hold the end of the receiver that has the cord.

Wait for the connection to be established. This takes a few seconds. The terminal or headset should have a light that goes on when this connection is set. You may now proceed to log onto Telenet, as follows:

1. Send a carriage return, semicolon, carriage return. This identifies the speed and code at which your terminal is operating. Telenet will identify itself and request an identification for your terminal:

```
TELENET
202 DL9
TERMINAL=
```

2. Type in the four-character ID for your terminal, obtained from the brochure or a local Telenet office. The code for a TI 745, for example, is T145. Telenet responds by printing an "@" sign. If you don't know the ID, you may just enter a carriage return - in most cases, this will be satisfactory.
3. Type a C (for connect), skip a space, and type the Stanford network address (41527):

```
@C 41527
```

Telenet will respond with

```
415 SU
CONNECTED
```

if the connection can be completed. If, instead, the message reads BUSY, NOT AVAILABLE, NOT OPERATING, or some similar message, hang up and try again later.

4. Proceed to Section 1.4 - do not forget the initial "000" described there.

1.4. LOGGING ONTO THE STANFORD COMPUTER

First, connect the terminal to the Stanford computer, either by direct dialing or via Telenet, as described in the preceding two sections.

All instructions to the Stanford computer must be terminated by depressing the RETURN key of the terminal.

Enter "000" (letter oh), followed by RETURN. The computer responds with:

STANFORD IBM-3033A (PORT xxxx-xxx) time date

It will then request your terminal type, account number, group code, and keyword. Give each of these as requested. The terminal type can be found by calling Stanford at (415) 497-2046. For most terminals, Z99 is quite adequate as a terminal type. The account code, group code, and keyword were given to you by Stanford when you were granted an account there.

You are now logged onto the computer. Succeeding actions depend on how your account is set up - the GRAD staff can give you assistance in setting up your account to meet your own desires.

Various events may occur to alter the normal proceedings given above. General messages may appear after you enter your keyword. These are preceded by SYSTEM NEWS (n ITEMS) and a list of the items. If an item is more than one line long, you will be asked if you wish to read it. Enter YES or NO or just RETURN (which is equivalent to NO).

If the response to the keyword is SYSTEM? or WYLBUR IS NOT AN ACTIVE SYSTEM, or WHAT'S THE MAGIC WORD?, or something similar, then the system isn't working - hang up and try again later.

When you are finished with the computer, you must log off of the system. Type:

LOGOFF CLEAR

The computer will print seven lines of statistics about the session, one of which gives the cost of the session. At any time after these lines begin, you may hang up the telephone - you don't need to wait for all of the lines to be printed, if you don't want to.

1.5. HELPFUL DOCUMENTS

You should obtain some or all of the following documents from Stanford, to help you in using the system.

1. Getting Started at the Campus Facility. [5]
2. Telenet Use at Stanford. [6]
3. Campus Facility Rate Schedule. [7]
4. A Guide to Searching -- a SPIRES Primer. [3]

You may wish to have your name added to the CAMPUS COMPUTING BULLETIN mailing list. For further information, call Document Sales at Stanford, (415) 497-4877, or write to:

Document Sales
Center for Information Technology
Forsythe Hall
Stanford University
Stanford, CA 94305

2. OBTAINING REPORTS FROM GRAD

Dialog packages, called protocols, have been prepared to assist the user in obtaining the more common reports. To use one of these protocols, it is first necessary to tell the computer system where the protocols are located; this is done by typing the command:

```
SET COMPEQ GRIDPROTO
```

Accounts we have helped set up will do this automatically, and this paragraph can then be ignored.

In the remainder of this section, we describe the general features of the protocols we provide. The individual protocols are then discussed in detail in Section 3. Please see references 1 and 3 for an explanation of terminology and general data structuring; detailed record structures are shown in the appendix to this report.

2.1. GENERAL INSTRUCTIONS

A protocol is initiated by entering two periods, the protocol name, and (optionally) one or more arguments. Arguments, if given, are separated by blanks or commas; omitted arguments must be delineated by commas. For example:

```
..ADDRESS.LIST PRINTER,ALL
..AREA.STATUS , STATE           [The first argument is omitted]
..LEASE.DETAILED
..LEASE.HOLDER T,AREA
..LEASE.SUMMARY OFFLINE
```

If no arguments are given, the protocol will begin with an introductory line, and ask if you wish instructions. From here on, it will ask for the required arguments. In any case, you will be prompted for values of missing or invalid arguments. We suggest that no arguments be given in the invocation command the first few times a protocol is used, so that you can become familiar with it. The more efficient method can be used thereafter.

The response to a question may require more space than will fit on a single line. The protocols will accept continuation lines; just end each line that is to be continued by the characters '//'. For example:

```
..AREA.STATUS P,COMPANY
:Companies? MAGMA ENERGY, MAGMA POWER, UNION//
:More? OIL, SHELL OIL, SUNEDCO
```

If you are in doubt as to how to answer a question, enter a question mark, '?', for an explanation.

It is occasionally necessary to interrupt a protocol for awhile, execute some basic system commands, and return to the protocol. For example, you may wish to examine some records before deciding on a selection criterion. You escape from the protocol by pressing the ESCAPE and RETURN keys, in response to any question. To re-enter the protocol, enter "CONT"; the question will be repeated. You would not want to try this, of course, if you are not familiar with the underlying SPIRES and WYLBUR systems.

You may stop the dialogue at any point by responding to any question with the BREAK (or ATTN) key.

Many questions can be answered YES or NO. These may be abbreviated to Y and N, respectively. NO may also be indicated by just pressing the

RETURN key - a series of questions with all NO answers can be responded to with a series of RETURN's.

2.2. ARGUMENTS TO PROTOCOLS

The protocols require two major arguments, and possibly one or more supplementary arguments. The major arguments may be entered in the invocation command, if desired. They describe the processing mode and type of record selection that is to be used; the supplementary arguments supply data values used in record selection.

The processing mode may be TERMINAL, PRINTER, or OFFLINE; these may be abbreviated to T, P and O, respectively. Implications are as follows:

TERMINAL. Processing will occur on-line (while you wait), and the resulting report will be displayed at your terminal. The first time during a session that you request a report on the terminal, you will be asked for certain terminal characteristics: whether it is a hard-copy or display-screen device, and (in the latter case), the number of lines available on the screen. The display will pause after each screen load and before beginning a new page to allow for examination of the report; continue by pressing the RETURN key. If you wish to stop the listing (for either hard-copy or display-screen terminals), press the BREAK key.

PRINTER. Processing will occur on-line, but the results are printed off-line on a printer at Stanford University. If we are not familiar with your account, you may be asked if we should mail the results to you; if so, you will be asked for your name and address. Once this has been given, it will be remembered for the rest of the session.

OFFLINE. Processing will occur off-line, at night, and the results will be printed at Stanford University. The main advantage is cost: the off-line mode currently costs about one-fourth as much as either of the other modes. The comments above about a mailing address apply here also.

The selection procedure depends on the protocol being invoked, but the possibilities tend to be similar, and are described here. Every protocol allows the ALL and USER options. The selection option may be abbreviated to sufficient initial characters to distinguish it from the other options.

ALL. Every record in the appropriate portion of the database will be included - all address records, all well records, etc.

USER. This option allows the user to control all record selection and sequencing. The protocol will be interrupted for you to issue the appropriate FIND and SEQUENCE commands. When the records you wish included are available in the SPIRES stack, result, or as a global FOR list [4], enter "CONT" to cause the report to be produced. If you are not familiar with the SPIRES query language, you will probably not wish to use this option.

STATE. Many protocols allow you to select all records that involve selected states - all wells in California, all leases in Nevada or Utah, all companies with offices in New Mexico. You will be prompted for the names of the states you wish included. Enter the state names, separated by commas. Abbreviations are allowed: CA, Cal, and Calif all denote California.

COUNTY, CITY. Some protocols allow you to select all records that involve selected counties (or cities) of a specified state. You will be prompted for the state name and one or more county (city) names. Separate county (city) names by commas. The state name may be abbreviated.

AREA, LEASE NUMBER, WELL NAME, etc. Many protocols permit you to select all records associated with one or more geothermal areas (lease numbers, well names, etc.). You will be prompted for the names of the areas (etc.) you wish included. Enter the names separated by commas.

As mentioned above, some arguments can be abbreviated: state names, organization types, roles, lease types, etc. In such cases, the permitted values of the element are restricted, and controlled by the system; any other values are forbidden, and result in an error message. For example, the only allowed values for the LEASE-TYPE element in the LEASE portion of the database are: COMPETITIVE, INDIAN, NONCOMPETITIVE, PRIVATE, and STATE (all may be abbreviated to their initial letter). However, LEASE-OWNER may have any name of a company or person as value. When not obvious, the values and their abbreviations are given with the individual protocol descriptions.

In all other cases, abbreviations are not allowed. Instead, you may truncate the value to three or more letters; all records that match the stem are selected. Truncation is indicated by adding a '#' to the stem. For example, 'Magma#' will match both Magma Energy and Magma Power.

Numerical arguments and dates cannot be abbreviated or truncated. Numbers that represent physical quantities should have units attached - most common abbreviations of units are accepted. For example, '37 feet', '24 lb/sq ft', '175 kg', '100 gallons / minute', etc. Internal units are SI (metric) - conversion takes place automatically from whatever units are used in response to a question to the internal units. If no unit is specified, the system assumes you intend to use the internal SI unit.

Dates may be written in most any reasonable form. For example, July 12, 1979 may be written 'July 12, 1979', '7/12/79', or '12 July 1979'. The name of the month may be abbreviated, and the day (or day and month) may be omitted if unknown. That is, 'Sept. 78' and '1976' are perfectly acceptable dates. The '19' may be omitted as long as the correct century is meant.

3. INDIVIDUAL PROTOCOL DESCRIPTIONS

3.1. ADDRESS LIST REPORT

This protocol will assist you in printing an address list.

To initiate the protocol, type:

```
..ADDRESS.LIST medium, selection
```

'Selection' may be ALL, USER, STATE, CITY, TYPE, ROLE, or COMPANY. TYPE denotes organization type; ROLE, the major function performed by the organization; and COMPANY, the organization name. Possible types (with abbreviations in parentheses) are:

Federal (F)	Local (L)
State (S)	Indian (I)
County (C)	Private (P)

Possible roles are:

Contractor (C)	Manufacturer (M)
Drilling Company (D)	Operator (O)
Financier (F)	Purchaser of Energy (P)
Lease Holder (H)	Regulatory Agency (R)
Land Owner (L)	

Examples:

1. To list all organization addresses on the off-line printer:

```
..ADDRESS.LIST PRINTER ALL
```

2. To list organizations from California and Nevada on the terminal:

```
..ADDRESS.LIST T,STATE
:States? Calif, NV
```

3. To list Magma Power on the terminal:

```
..ADDRESS.LIST T,COMPANY
:Organizations? MAGMA POWER
```

4. To list organizations from certain cities on the printer:

```
..ADDRESS.LIST P, CITY
:State? CALIFORNIA
:Cities? SANTA BARBARA, LOS ANGELES, SAN//
:More? FRANCISCO, SAN JOSE, RIVERSIDE
```

This report provides a brief description of organizations and persons involved in geothermal development. The description includes (where known): type of organization (private, Indian or government), roles played in geothermal development, address and phone numbers. The organization name is given in two forms: at the upper left of each report entry is an abbreviated form of the name, and at the upper right is the full form. The abbreviated form is used elsewhere in the database to refer to that organization. For example, records in the Well File refer to "Dixie Drilling", not "Dixie Drilling Co."

LINDA H. BUCKLIN Type: Private Role: Lease holder	Ms. Linda H. Bucklin 4275 Hackamore Drive Reno, Nevada 89509
GEOTHERMAL FOOD PROCESSORS Type: Private	Geothermal Food Processors, Inc. P. O. Box 768 Fernley, Nevada 89408 (702) 423-5943
DIXIE DRILLING Type: Private Role: Drilling company	Dixie Drilling Co. P. O. Box 494 Fernley, Nevada 89408 (702) 575-4268
CER Type: Private	CER Corp. P. O. Box 15090 Las Vegas, Nevada 89114 (702) 735-7136
COMPASS GEOTHERMAL Type: Private Role: Lease holder	Compass Geothermal P. O. Box 118 Schurtz, Nevada 89427
YVONNE A. HAGER Type: Private Role: Lease holder	Ms. Yvonne A. Hager 535 Lay St. Winnemucca, Nevada 89445
WILLIAM A. HENDREY Type: Private Role: Lease holder	Mr. William A. Hendrey P. O. Box 3282 Reno, Nevada 89505
WARREN M. WOODWARD Type: Private Role: Lease holder	Mr. Warren M. Woodward 125 Drew Drive Reno, Nevada 89511 (702) 825-3079

Figure 1. Example of an Address List Report

3.2. GEOHERMAL RESOURCE AREA STATUS REPORT

This protocol may be used to print an Area Status Report.

To initiate the protocol, type:

```
..AREA.STATUS medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, AREA, or COMPANY. If you select STATE or COUNTY, the report will include all areas within the specified states or counties. If you select AREA, the report will include the specified areas. If you select COMPANY, the report will include all areas in which one or more of the specified companies are involved.

Examples:

1. To list all areas on the off-line printer:

```
..AREA.STATUS PRINTER ALL
```

2. To list areas from California and Nevada on the terminal:

```
..AREA.STATUS T,STATE  
:States? Calif, NV
```

3. To list East Mesa on the terminal:

```
..AREA.STATUS T,AREA  
:Areas? East Mesa
```

4. To list areas in which certain companies are involved, on the printer:

```
..AREA.STATUS P, COMPANY  
:Companies? Magma#, Union Oil,Repub#,//  
:More? Shell Oil, USGS
```

This report summarizes the current state of development of the area, under the headings Development Status, Major Markets, Resource Characteristics, Exploratory Surveys, Leasing, Drilling, Plants, and Major Organizations Involved. Sections that do not apply to a particular area are omitted. Missing data is indicated by '???'.

The report heading gives the location of the area and the date the report was last updated for this area. Development Status attempts to roughly characterize development, using such terms as: No Development, Preliminary Exploration, Land Acquisition, Exploration, Deep Drilling, various stages of plant building (Planning, Approval, Construction, Operational), and Fully Developed. The status may change as development progresses.

The Major Markets Section lists the most important actual or potential markets for the area. Examples are: Electricity, Space Heating, Agriculture, Fish Raising, and Plant Drying.

The Resource Characteristics Section gives an estimate of several physical parameters. Generally an estimated value and a range of probable values are given (Volume, Power Potential and Thermal Energy have no range). Estimates may be mean values or most likely values, depending on the reference. Some of these estimates have large potential errors for the less developed areas.

The section on surveys lists the most important surveys performed and reported - no details are given.

The Leasing Section gives lease data and total land area, by type of land ownership. If no leasing has occurred, zeros are entered.

The Drilling Section summarizes the number of wells spudded and completed, by current status. Temperature gradient holes are not included in this tabulation. Some statistics are then provided on the wells - depth, surface temperature and surface flow. The number of wells used to obtain these statistics is also given, to provide an indication of reliability.

The section on plants summarizes electric power plants and direct use facilities by development status. Entries in this section give number of plants (facilities) and total power for those plants (facilities); in the example, '3/120' denotes 3 electric power plants planned for a total power of 120 Mwe. A second page of the report lists all plants and facilities, giving name, year on line, fluid supplier, utility and rated output. This list is arranged by plant status - operational, under construction, and planned. Direct use facilities also indicate the type of use.

Major organizations included major lease holders, well owners, utilities, government agencies promoting or regulating development, etc.

STATUS REPORT FOR ROOSEVELT HOT SPRINGS JULY 18, 1980
 Roosevelt Hot Springs KGRA, Beaver county, Utah

Development Status: Plant Planning

Major Markets: Electricity

Resource Characteristics	Estimated	
	Value	Range
Depth to Top of Reservoir (ft)	4,012	1,253 - 6,102
Reservoir Thickness (ft)	6,562	4,921 - 8,202
Reservoir Area (sq miles)	9.1	2.3 - 19.3
Reservoir Volume (cu miles)	11.3	
Temperature (deg F)	509 (265 C)	469 - 543
Total Dissolved Solids (ppm)	7,800	5,000 - 8,000
Electric Power Potential (MWe, 30 yrs)	970	
Thermal Energy (10**15 Btu)	28.5	

Exploratory Surveys: Seismic Methods, Gravity, Geological, Heat Flow, Electrical Resistivity, Thermal Gradient

Leasing

	Federal	State	Private	Other	Total
Nmbr. Leases	26	4	3	0	33
Nmbr. Leaseholders	12	4	2	0	18
Acres under Lease	37,386	2,482	2,533	0	42,401
Acres Withdrawn	5,305	0	0	0	5,305
Total Acres in Area	37,386	2,482	2,864	0	42,732

Drilling

23 Wells Spudded	2 Production	14 Idle, Suspended
18 Wells Completed	0 Injection	0 Abandoned
	2 Observation	5 Type Unknown

	Well Statistics		Nmbr. Wells Reporting
	Average	Range	
Depth (ft)	5,735	1,253 - 7,513	9
Sfc. Temp. (deg F)	???	???	???
Sfc. Flow (lb/sec)	???	???	???

Plants (Entries are Nmbr. Plants/Total Power)

Type	Operational	Under Constr.	Planned	Total
Electric Power (MWE)	0/0	0/0	3/120	3/120
Direct Use (10**9 Btu/yr)	0/0.0	0/0.0	0/0.0	0/0.0
Total Plants (MWe Equivalent)	0/0	0/0	3/120	3/120

Major Organizations Involved in Area Development

Phillips Petroleum	Rogers Engineering
O'Brien Resources	Utah Power & Light
AMAX Exploration	Thermal Power
Union Oil	Geothermal Exploration
Plattsburgh Quarries	Chevron USA

O'Brien, Phillips and Thermal have unitized the production of their individual interests.

Note: ??? denotes Value Unknown

Figure 2. Example of an Area Status Report

MAJOR PROJECTS AT ROOSEVELT HOT SPRINGS JULY 18, 1980

ELECTRIC POWER PLANTS AT ROOSEVELT HOT SPRINGS

Plant Name	Year on Line	Geothermal Fluid Supplier	Utility	Rated Output (MWe)
Planned				
???	1983	Phillips Petroleum	Utah Power & Light	20
???		Phillips Petroleum	Utah Power & Light	50
???		Phillips Petroleum	Utah Power & Light	50
			Total	120

Figure 2 (cont). Example of an Area Status Report

3.3. RESOURCE CHARACTERISTICS REPORT

This protocol will assist you in obtaining a Resource Characteristics Report. The report gives estimated values for seven reservoir properties for each geothermal area included. These are: depth to production, thickness, area, volume, temperature, power potential, and thermal energy.

To initiate the protocol, type:

```
..RESOURCE.CHAR medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all areas on the off-line printer:

```
..RESOURCE.CHAR PRINTER ALL
```

2. To list areas from California and Nevada on the terminal:

```
..RESOURCE.CHAR T,STATE  
:States? Calif, NV
```

3. To list East Mesa on the terminal:

```
..RESOURCE.CHAR T,AREA  
:Areas? East Mesa
```

JULY 7, 1981 RESOURCE CHARACTERISTICS
(Estimated Values) Page 1

AREA	DEPTH TO PRODUCTION (ft)	R E S E R V O I R THICKNESS (ft)	AREA (sq mi)	VOLUME (cu mi)	TEMP (F)	POWER POTENTIAL (MWe for 30 yrs)	THERMAL ENERGY (10**15 BTU)
----- Colusa county, California -----							
LOVELADY RIDGE		4,920	0.6	0.5	140		0.0
WILBUR SPRINGS	3,280	4,920	2.3	3.0	146		4.1
----- Imperial county, California -----							
BRAWLEY	6,232	4,264	9.9	8.2	253	640	20.9
DUNES	656	5,576	2.0	2.1	132		2.8
EAST BRAWLEY							
EAST MESA	5,904	3,608	12.4	8.7	182	360	15.5
GLAMIS	4,920	5,576	0.8	0.8	132		0.9
HEBER	4,920	5,576	16.1	17.0	175	650	28.5
SALTON SEA	1,640	6,232	23.3	28.0	323	3,400	94.9
SOUTH BRAWLEY							
WESTMORLAND	3,608	4,920	30.9	29.4	217	1,710	66.4
----- Inyo county, California -----							
COSO HOT SPRINGS	1,640	5,576	10.5	10.9	220	650	28.5
----- Lake county, California -----							
CHALK MOUNTAIN	4,920	5,576	0.8	0.8	113		0.8
CLEAR LAKE	4,920	5,576	19.3	20.0	190	900	37.3
VOLCANIC FIELD							
SULPHUR BANK MINE	4,920	5,576	1.5	1.6	194	75	3.1

Figure 3. Example of a Resource Characteristics Report

3.4. LEASE DETAIL REPORT

This protocol will assist you in printing a Lease Detail Report.

To initiate the protocol, type:

```
..LEASE.DETAIL medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, AREA, or LEASE.

Examples:

1. To list all leases on the off-line printer:

```
..LEASE.DETAIL PRINTER ALL
```

2. To list leases in California and Nevada on the terminal:

```
..LEASE.DETAIL T,STATE
:States? Calif, NV
```

3. To list leases in East Mesa on the terminal:

```
..LEASE.DETAIL T,AREA
:Area? EAST MESA
```

4. To list leases from certain counties on the printer:

```
..LEASE.DETAIL P, COUNTY
:State? CALIFORNIA
:Counties? INYO,LAKE, SONOMA,//
:More? IMPERIAL
```

This report gives all of the information we have on various geothermal leases. The upper left corner of each entry shows the lease number and type (competitive, noncompetitive, or Indian). The upper right corner gives the geothermal area in which the leased land occurs (if any) and the name of the leaseholder(s). The next line identifies type of land owner (private, Indian or government) and the name of the owner (or managing agency, in the case of government land). Location is specified in township-range-section terms, and size is in acres. Dates on which the lease was issued, will terminate, and was turned back are given; if no date turned back appears, the lease is currently active. The last line gives bonus, rent and royalty when these are known.

JAN. 22, 1981

LEASE DETAIL REPORT

Page 1.

U 27386
Competitive
Land owner: Federal
State: Utah
Meridian: Salt Lake
Township: 026 S
Range: 009 W
Section: 33
34 W1/2 W1/2, NE1/4
NW1/4, NE1/4,
E1/2 SE1/4
35
3
4 NE1/4 NE1/4
027 S 009 W
2,463.37 acres
Issued: OCT. 1, 1974
Bonus: \$314199.05
Terminates:
Turned back:

U 27387
Competitive
Land owner: Federal
State: Utah
Meridian: Salt Lake
Township: 026 S
Range: 009 W
Section: 30 NW1/4, N1/2,
SW1/4 SW1/4
31 S1/2
6
7 N1/2
027 S 009 W
1,644.05 acres
Issued: OCT. 1, 1974
Bonus: \$8401.10
Terminates:
Turned back:

U 27388
Competitive
Land owner: Federal
State: Utah
Meridian: Salt Lake
Township: 027 S
Range: 009 W
Section: 4 S1/2
5 E1/2, SW1/4 SW1/4
8
9 N1/2, N1/2 SE1/4,
SW1/4, SE1/4 SE1/4
027 S 009 W
1,939.65 acres
Issued: OCT. 1, 1974
Bonus: \$248391.58
Terminates:
Turned back:

Figure 4. Example of a Lease Detail Report

3.5. LEASE HOLDER SUMMARY REPORT

This protocol will assist you in printing a Lease Holder Summary Report.

To initiate the protocol, type:

```
..LEASE.HOLDER medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To produce a Lease Holder Summary Report for all areas:

```
..LEASE.HOLDER PRINTER ALL
```

2. To produce a Lease Holder Summary Report for California and Nevada on the terminal:

```
..LEASE.HOLDER T,STATE
:States? Calif, NV
```

3. To report on East Mesa on the terminal:

```
..LEASE.HOLDER T,AREA
:Areas? EAST MESA
```

4. To list areas from certain counties on the printer:

```
..LEASE.HOLDER P, COUNTY
:State? CALIFORNIA
:Counties? LAKE, SONOMA, INYO, IMPERIAL, //
:More? ALAMEDA, CONTRA COSTA
```

This report provides statistics on leasing by geothermal area and leaseholder. The report shows, for each area and leaseholder within the area, total acres leased by that leaseholder, number of leases (including both currently active and terminated leases), average age and maximum age. (The age of a lease is defined to be the elapsed time between the date it was issued and the report date.) Summaries for the area include total number of leaseholders, total acreage, total number of leases, and average and maximum age of leases in the area.

Dec. 15, 1980

LEASE HOLDER SUMMARY

Page 1

AREA	LEASE HOLDER	ACREAGE	NUMBER LEASES	AGE (yrs)	
				AVE	MAX
Cove Fort-Sulphurdale	Amax Exploration	7,213	6	4.9	5.7
	American Geological En	4,402	3	5.7	5.7
	Caroline L. Hunt Trust	20,617	12	4.4	5.2
	Chevron USA	653	1	2.7	2.7
	Forminco	8,745	7	5.6	5.7
	Geothermal Exploration	3,194	2	5.5	5.5
	James A. Becker	1,654	2	5.4	5.5
	Nelson B. Hunt	6,962	6	5.6	5.6
	Noeth B. Gillette	2,934	2	5.0	5.5
	Norma K. Hunt	1,279	2	5.4	5.5
	O'Brien Resources	1,279	2	2.5	2.5
	Phillips Petroleum	12,241	9	5.1	5.5
	Thermal Power	5,093	3	1.5	2.0
	Union Oil	591	1	5.2	5.2
	W. H. Hunt	1,650	2	2.6	2.6
AREA SUMMARY:	15	78,516	60	4.7	5.7
Roosevelt Hot Springs	Chevron USA	1,304	1	5.6	5.6
	Gary W. Seltzer	2,484	2	5.5	5.5
	Geothermal Exploration	639	1	5.5	5.5
	Getty Oil	1,919	1	6.2	6.2
	Gwendolyn Weiner	1,380	1	4.5	4.5
	Milton S. Fisher	2,156	1	5.5	5.5
	O'Brien Resources	3,854	3	5.2	5.2
	Phillips Petroleum	17,680	10	6.3	6.3
	Plattsburgh Quarries	39	1	6.2	6.2
	Roosevelt Hot Springs	2,932	6		
	Thermal Power	1,321	2		
	Trevar L. Windsor	6,428	3	5.2	5.5
	Union Oil	2,679	5	6.2	6.2
W. H. Hunt	79	1	1.9	1.9	
AREA SUMMARY:	14	44,904	38	5.7	6.3

Figure 5. Example of a Lease Holder Summary Report

3.6. LEASE SUMMARY REPORT

This protocol will assist you in printing a Lease Summary Report.

To initiate the protocol, type:

```
..LEASE.SUMMARY medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To produce a Lease Summary Report for all areas:

```
..LEASE.SUMMARY PRINTER ALL
```

2. To produce a Lease Summary Report for California and Nevada on the terminal:

```
..LEASE.SUMMARY T,STATE
:States? Calif, NV
```

3. To report on East Mesa on the terminal:

```
..LEASE.SUMMARY T,AREA
:Areas? EAST MESA
```

4. To list areas from certain counties on the printer:

```
..LEASE.SUMMARY P, COUNTY
:State? CALIFORNIA
:Counties? LAKE, SONOMA, INYO, IMPERIAL, //
:More? ALAMEDA, CONTRA COSTA
```

This report provides a brief summary of geothermal leasing in selected geothermal areas. Price per acre gives pricing data for those leases in the area for which prices are known. (This can be misleading if prices of only a few leases are available.) The right hand column provides statistics on the leases, giving: number of leases, total acres leased, average acreage per lease, number of leaseholders, and average and maximum age. Age is defined to be the elapsed time between the date the lease was issued and the report date. Both active and terminated leases, private and government leases, are included in the statistics (unless USER is selected).

Dec. 15, 1980		LEASE SUMMARY		Page 1
Cove Fort-Sulphurdale				Utah
Price per acre:		Number of leases:		60
Minimum:	\$2.12	Total acres leased:	78,516	
Average:	\$198.33	Ave. acres/lease:	1,309	
Maximum:	\$442.91	Ave. lease age (yrs):	4.7	
Average royalty:		Max. lease age (yrs):	5.7	
		Nbr. leaseholders:	15	
<hr/>				
Crater Springs				Utah
Price per acre:		Number of leases:		19
Minimum:	\$3.25	Total acres leased:	38,870	
Average:	\$3.30	Ave. acres/lease:	2,046	
Maximum:	\$3.57	Ave. lease age (yrs):	4.4	
Average royalty:		Max. lease age (yrs):	4.7	
		Nbr. leaseholders:	7	
<hr/>				
Lund				Utah
Price per acre:		Number of leases:		6
Minimum:	\$1.77	Total acres leased:	10,042	
Average:	\$1.77	Ave. acres/lease:	1,674	
Maximum:	\$1.77	Ave. lease age (yrs):	4.7	
Average royalty:		Max. lease age (yrs):	5.0	
		Nbr. leaseholders:	3	
<hr/>				
Meadow-Hatton				Utah
Price per acre:		Number of leases:		5
Minimum:	\$16.28	Total acres leased:	6,930	
Average:	\$16.28	Ave. acres/lease:	1,386	
Maximum:	\$16.28	Ave. lease age (yrs):	2.8	
Average royalty:		Max. lease age (yrs):	3.4	
		Nbr. leaseholders:	4	
<hr/>				
Monroe-Joseph				Utah
Price per acre:		Number of leases:		11
Minimum:	\$2.26	Total acres leased:	13,341	
Average:	\$19.27	Ave. acres/lease:	1,213	
Maximum:	\$45.11	Ave. lease age (yrs):	4.3	
Average royalty:		Max. lease age (yrs):	5.5	
		Nbr. leaseholders:	5	

Figure 6. Example of a Lease Summary Report

3.7. STATE SUMMARY REPORT

This protocol will assist you in printing a State Summary Report. This report gives lease number, type, land owner type, acreage, date issued, and lease holder. Lease type and land owner type are abbreviated as follows:

C - Competitive	C - County
I - Indian	F - Federal
N - Noncompetitive	I - Indian
P - Private	L - Local
S - State	P - Private
	S - State

A table is given for each state, giving total number of leases and total acreage, for noncompetitive and competitive leases.

To initiate the protocol, type:

```
..STATE.SUMMARY medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, AREA, or LEASE.

Examples:

1. To produce a State Summary Report on the printer for all leases:

```
..STATE.SUMMARY PRINTER ALL
```

2. To produce the report offline for California and New Mexico:

```
..STATE.SUMMARY OFFLINE,STATE  
:State? CA, NM
```

MAY 19, 1981

Colorado LEASES

Page 1

LEASE #	TYPE	LAND	ACREAGE	ISSUED	LEASE HOLDER
C 20103	N	F	329	12/01/75	Phillips Petroleum
C 20104	N	F	320	08/01/75	Phillips Petroleum
C 20107	N	F	1,120	08/01/75	Phillips Petroleum
C 20109	N	F	1,644	08/01/75	Phillips Petroleum
C 20114	N	F	80	12/01/75	Oxy Petroleum
C 20115	N	F	1,549	08/01/75	Oxy Petroleum
C 20116	N	F	1,279	12/01/75	Oxy Petroleum
C 20117	N	F	2,112	12/01/75	Oxy Petroleum
C 20118	N	F	1,286	08/01/75	Oxy Petroleum
C 20122	N	F	1,867	02/01/77	Chevron USA
C 20123	N	F	2,127	02/01/77	Chevron USA
C 20124	N	F	645	02/01/77	Chevron USA
C 20125	N	F	160	09/01/75	Chevron USA
C 20138	N	F	1,795	12/01/75	Geothermal Kinetics
C 20139	N	F	1,203	12/01/75	Geothermal Kinetics
C 20140	N	F	320	09/01/79	Geothermal Kinetics
C 20144	N	F	800	09/01/75	Mapco
C 20145	N	F	1,919	09/01/75	Mapco
C 20146	N	F	2,078	09/01/75	Mapco
C 20152	N	F	1,504	09/01/75	Mapco
C 20153	N	F	1,000	06/01/76	Earth Power
C 20155	N	F	720	03/01/76	Earth Power
C 20158	N	F	1,879	03/01/76	Chevron USA
C 20350	N	F	160	03/01/76	Earth Power
C 20352	N	F	1,003	03/01/76	Earth Power
C 20353	N	F	2,262	03/01/76	Earth Power
C 20359	N	F	2,284	03/01/76	Thermal Resources
C 20361	N	F	640	03/01/76	Thermal Resources
C 20362	N	F	1,080	03/01/76	Thermal Resources
C 20364	N	F	1,160	03/01/76	Thermal Resources
C 20564	N	F	2,326	09/01/79	Utah International
C 20565	N	F	2,334	09/01/79	Utah International
C 20571	N	F	643	09/01/79	Geothermal Kinetics
C 20573	N	F	827	12/01/75	Geothermal Kinetics
C 20574	N	F	1,335	12/01/75	Geothermal Kinetics
C 20575	N	F	640	09/01/75	Mapco
C 20576	N	F	398	09/01/75	Mapco
C 20804	N	F	240	12/01/75	Ladd Petroleum
C 20807	N	F	883	12/01/75	Ladd Petroleum
C 20936	N	F	680	08/01/76	Utah International
C 20938	N	F	2,305	12/01/75	Ladd Petroleum
C 21388	N	F	280	12/01/75	Ladd Petroleum
C 22326	N	F	781	02/01/77	Buttes Resources
C 22597	N	F	2,226	02/01/77	Buttes Resources
C 22598	N	F	1,804	02/01/77	Buttes Resources
C 22599	N	F	1,040	02/01/77	Buttes Resources
C 22600	N	F	1,969	02/01/77	Buttes Resources
C 22722	C	F	915	07/01/75	Oxy Petroleum

Colorado SUMMARY:	NONCOMP	COMP	TOTAL
# LEASES:	47	1	48
ACREAGE:	57,056	916	57,972

Figure 7. Example of a State Summary Report

3.8. LEASE HOLDER TOTALS REPORT

This protocol will assist you in printing a Lease Holder Totals Report. This report summarizes leases by lease holder, year leased, state and county, giving total number of leases and total acreage of noncompetitive and competitive leases at each level.

To initiate the protocol, type:

..LEASE.HOLDER.TOTALS medium, selection

'Selection' may be ALL, USER, STATE, COUNTY, AREA, or LEASE.

Examples:

1. To produce a report for all leases offline:

..LEASE.HOLDER.TOTALS 0, ALL

2. To produce the report for California and Nevada leases:

..LEASE.HOLDER.TOTALS T,STATE
:State? Calif, Nev

LEASEHOLDER	YEAR ST AREA	COUNTY	NONCOMPETITIVE NBR ACRES	COMPETITIVE NBR ACRES	TOTAL NBR ACRES
Republic Geothermal	1974 OR Vale Hot Springs	Malheur		1 1,347	1 1,347
	TOTALS FOR STATE OF Oregon			1 1,347	1 1,347
	TOTAL FOR 1974			1 1,347	1 1,347
Republic Geothermal	1975 UT Thermo Hot Springs	Beaver	1 2,314		1 2,314
	TOTALS FOR STATE OF Utah		1 2,314		1 2,314
	TOTAL FOR 1975		1 2,314		1 2,314
Republic Geothermal	1975 NV	Mineral	3 3,630		3 3,630
	TOTALS FOR STATE OF Nevada		3 3,630		3 3,630
	TOTAL FOR 1975		3 3,630		3 3,630
Republic Geothermal	1975 OR Alvord Hot Springs	Harney		5 10,081	5 10,081
	TOTALS FOR STATE OF Oregon			5 10,081	5 10,081
	TOTAL FOR 1975			5 10,081	5 10,081
Republic Geothermal	1976 UT Thermo Hot Springs	Beaver	1 919		1 919
Republic Geothermal	1976 UT Lund	Iron	4 6,115		4 6,115
	TOTALS FOR STATE OF Utah		5 7,035		5 7,035
	TOTAL FOR 1976		5 7,035		5 7,035
Republic Geothermal	1976 UT Thermo Hot Springs	Beaver		1 1,200	1 1,200
	TOTALS FOR STATE OF Utah			1 1,200	1 1,200
	TOTAL FOR 1976			1 1,200	1 1,200
Republic Geothermal	1976 NV	Mineral	8 12,167		8 12,167
	TOTALS FOR STATE OF Nevada		8 12,167		8 12,167
	TOTAL FOR 1976		8 12,167		8 12,167
Republic Geothermal	1976 UT	Beaver	1 2,559		1 2,559
Republic Geothermal	1976 UT	Iron	2 3,040		2 3,040
	TOTALS FOR STATE OF Utah		3 5,600		3 5,600
	TOTAL FOR 1976		3 5,600		3 5,600
Republic Geothermal	1976 NV Dixie Hot Springs	Churchill		2 4,162	2 4,162
Republic Geothermal	1976 NV Dixie Hot Springs	Pershing		1 1,919	1 1,919
	TOTALS FOR STATE OF Nevada			3 6,082	3 6,082
	TOTAL FOR 1976			3 6,082	3 6,082
Republic Geothermal	1977 NV Dixie Hot Springs	Churchill		1 2,559	1 2,559
Republic Geothermal	1977 NV Dixie Hot Springs	Pershing		2 4,879	2 4,879
	TOTALS FOR STATE OF Nevada			3 7,439	3 7,439
	TOTAL FOR 1977			3 7,439	3 7,439
Republic Geothermal	1979 NV Dixie Hot Springs	Churchill	1 1,279		1 1,279
Republic Geothermal	1979 NV	Mineral	1 1,257		1 1,257
	TOTALS FOR STATE OF Nevada		2 2,537		2 2,537
	TOTAL FOR 1979		2 2,537		2 2,537

Figure 8. Example of a Lease Holder Totals Report

3.9. WELL DETAIL REPORT

This protocol will assist you in printing a Well Detail Report. The report provides all of the information in the database about the selected wells.

To initiate the protocol, type:

```
..WELL.DETAIL medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To produce an offline report on all wells:

```
..WELL.DETAIL OFFLINE ALL
```

2. To list wells in Utah and New Mexico on the printer:

```
..WELL.DETAIL P, STATE
:States? UTAH, NM
```

3. To list all wells at East Mesa on the terminal:

```
..WELL.DETAIL T, AREA
:Areas? EAST MESA
```

The report begins, for each well, by displaying the well name, API number, the number of the APD granted for the well, lease number for the land on which the well is located, the well owner(s), and drilling company. A section labelled "Location" describes the exact location of the well, using the township system. Relevant dates are given, including date spudded, date completed, and the date upon which the well location was filed. Well depth is given in feet. Well type gives the category of well (if not a geothermal deep hole) and latest reported status from the following lists:

```
Fresh Water
Heat Flow
Temperature Gradient
```

```
Abandoned
Injection
Observation
Producible
Suspended
Idle
Potential Producer
Test
```

MAY 26, 1981

WELL DETAIL REPORT

Page 1.

Well name: MAMMOTH 1
API #: 04-051-90020

Owner: Union Oil
Drilled by: Loffland Brothers

Location:

Long Valley Caldera geothermal area. Mono county, California.
Mt. Diablo Meridian. Section 32 of township 3 S, range 28 E.
1,601'S, 1,749'E of NW corner.

Date spudded: 07/20/79
Type: Idle

Completed: 08/08/79
Well depth: 6,499 ft

Well name: LONG VALLEY 66-29
APD #: 0030
Lease #: CA 963

Owner: Republic Geothermal

Location:

Long Valley Caldera geothermal area. Mono county, California.
Mt. Diablo Meridian. Section 29 of township 3 S, range 29 E.
1,450'N, 1,808'W of SE corner.

Date spudded: 05/15/76
Type: Suspended

Completed: 06/10/76
Well depth: 6,919 ft

Well name: BRANDT 1
API #: 04-025-90187

Owner: Chevron Oil
Drilled by: Peter Bawden

Location:

Brawley geothermal area. Imperial county, California.
San Bernardino Meridian. Section 17 of township 13 S, range 14 E.
899'N, 997'E of SW corner.

Date spudded: 08/07/78
Type: Suspended

Completed: 10/27/78
Well depth: 10,013 ft

Well name: MERCER 1-28
API #: 04-025-90165

Owner: McCulloch Geothermal
Drilled by: Republic Drilling

Location:

South Brawley geothermal area. Imperial county, California.
San Bernardino Meridian. Section 28 of township 14 S, range 14 E.
659'S, 2,041'E of NW corner.

Date spudded: 07/11/78
Type: Producing

Completed: 03/15/79
Well depth: 13,382 ft

Figure 9. Example of a Well Detail Report

3.10. WELL FLOW REPORT

This protocol will assist you in printing a Well Flow Report, giving, for each well reported on, the date completed, depth, type, and wellhead temperature, pressure and flow rate.

To initiate the protocol, type:

```
..WELL.FLOW medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all wells at East Mesa on the printer:

```
..WELL.FLOW PRINTER AREA  
:Areas? EAST MESA
```

2. To report on all California and Nevada wells offline:

```
..WELL.FLOW O, STATE  
:States? CA, NEV ADA
```

3. To list wells in Lake County, Oregon, on the terminal:

```
..WELL.FLOW TERMINAL COUNTY  
:State? ORE  
:Counties? LAKE
```

MAY 27, 1981 GEOTHERMAL WELLS AT Long Valley Caldera, California

WELL NAME	DATE COMPLETED	DEPTH (ft)	WELL TYPE	WELLHEAD		
				TEMP (F)	PRESSURE (lb/sq in)	FLOW (lb/hr)
CA-963 66-29	06/10/76	6,962				
CASA DIABLO 1	06/01/60	387	Abandoned			
CHANCE 1	11/01/61	804	Abandoned			
CLAY PIT 1	08/08/79	6,494	Idle	194		
ENDOGENOUS 1	08/17/60	630	Producible	363	84	530,955
ENDOGENOUS 2	09/10/60	810	Producible	358	70	286,985
ENDOGENOUS 3	09/28/60	571	Producible	315		348,970
ENDOGENOUS 4	12/26/61	804	Abandoned	331	66	330,002
ENDOGENOUS 5	07/24/62	403	Abandoned	324	84	550,003
ENDOGENOUS 6	08/24/62	754	Abandoned			
ENDOGENOUS 7	09/25/62	669	Abandoned		64	
LONG VALLEY 66-29	06/10/76	6,918	Suspended			
MAMMOTH 1	08/08/79	6,498	Idle	194		
MAMMOTH 1	12/06/59	1,063	Abandoned	270		
STATE PRC 4397-1 1	09/27/71	4,110	Abandoned			
WATER WELL 1	07/24/69	36	Abandoned			

THERE ARE 16 WELLS AT Long Valley Caldera

Figure 10. Example of a Well Flow Report

3.11. WELL DRILLING DATA REPORT

This protocol will assist you in printing a Well Drilling Data Report. The report gives, for each well: well name, well owner, depth, wellhead temperature and pressure, and date completed. Summary data for each area gives total number of wells, and average depth, temperature and pressure. The latter are over the wells that have reported depths, temperatures or pressures; if only a few such reports are given in the body of the report, the summaries should be interpreted cautiously.

To initiate the protocol, type:

```
..WELL.DATA medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all wells at East Mesa on the printer:

```
..WELL.DATA PRINTER AREA  
:Areas? EAST MESA
```

2. To report on all California and Nevada wells offline:

```
..WELL.DATA 0, STATE  
:States? CA, NEV ADA
```

3. To list wells in Lake County, Oregon, on the terminal:

```
..WELL.DATA TERMINAL COUNTY  
:State? ORE  
:Counties? LAKE
```

MAY 27, 1981

WELL DRILLING DATA
Long Valley Caldera

Page 1.

WELL NAME	WELL OWNER	DEPTH (feet)	WELLHEAD TEMP (F)	PRESSURE (lb/sq in)	DATE COMPLETED
CA-963 66-29	Republic Geothermal	6,963			06/10/76
CASA DIABLO 1	Magma Energy	387			06/01/60
CHANCE 1	Magma Power	803			11/01/61
CLAY PIT 1	Union Oil	6,496	194		08/08/79
ENDOGENOUS 1	Magma Energy	629	343	84	08/17/60
			363		
ENDOGENOUS 2	Magma Energy	810	341	70	09/10/60
			357		
ENDOGENOUS 3	Magma Energy	570	314		09/28/60
ENDOGENOUS 4	Magma Energy	803	330	66	12/26/61
ENDOGENOUS 5	Magma Energy	403	323	84	07/24/62
ENDOGENOUS 6	Magma Energy	754			08/24/62
ENDOGENOUS 7	Magma Energy	669		64	09/25/62
LONG VALLEY 66-29	Republic Geothermal	6,919			06/10/76
MAMMOTH 1	Union Oil	6,499	194		08/08/79
MAMMOTH 1	Magma Energy	1,062	269		12/06/59
STATE PRC 4397-1 1	USGS	4,110			09/27/71
WATER WELL 1	Magma Energy	36			07/24/69
TOTAL: 16		AVERAGE: 2,370	303	74	

Figure 11. Example of a Well Drilling Data Report

3.12. WELL FOOTAGE REPORT

This protocol will assist you in printing a Well Footage Report. The report gives, for each state, area, well owner, and calendar year: the total number of wells drilled and total footage drilled.

To initiate the protocol, type:

```
..WELL.FOOTAGE medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all wells at East Mesa on the printer:

```
..WELL.FOOTAGE PRINTER AREA  
:Areas? EAST MESA
```

2. To report on all California and Nevada wells offline:

```
..WELL.FOOTAGE O, STATE  
:States? CA, NEV ADA
```

3. To list wells in Lake County, Oregon, on the terminal:

```
..WELL.FOOTAGE TERMINAL COUNTY  
:State? ORE  
:Counties? LAKE
```

MAY 27, 1981

California WELLS

Page 1

AREA	WELL OWNER	YEAR	NBR. WELLS	TOTAL FOOTAGE
East Mesa	BUREC	1972	1	8,031
East Mesa	BUREC	1973	1	6,004
East Mesa	BUREC	1974	3	18,419
East Mesa	Imperial Occidental	1979	1	1,699
East Mesa	Magma Energy	1972	1	6,070
East Mesa	Magma Power	1972	5	3,094
East Mesa	Magma Power	1976	2	14,852
East Mesa	Magma Power	1977	1	3,094
East Mesa	Magma Power	1978	5	27,841
East Mesa	Republic Geothermal	1978	4	0
East Mesa	Republic Geothermal	1975	8	25,033
East Mesa	Republic Geothermal	1977	5	27,484
East Mesa	Republic Geothermal	1978	1	7,339
East Mesa	Republic Geothermal	1979	6	20,728
East Mesa	Republic Geothermal	1980	1	6,290

Figure 12. Example of a Well Footage Report

3.13. WELL LOCATIONS REPORT

This protocol will assist you in printing a Well Locations Report, giving the exact location of selected geothermal wells by state and county.

To initiate the protocol, type:

```
..WELL.LOCATIONS medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all wells at East Mesa on the printer:

```
..WELL.LOCATIONS PRINTER AREA
:Areas? EAST MESA
```

2. To report on all California and Nevada wells offline:

```
..WELL.LOCATIONS O, STATE
:States? CA, NEV ADA
```

3. To list wells in Lake County, Oregon, on the terminal:

```
..WELL.LOCATIONS TERMINAL COUNTY
:State? ORE
:Counties? LAKE
```

The report gives well name, owner, type, area and location. The latter includes meridian, township, range, section, and exact location within the section, where known. Well type gives the category of well (if not a geothermal deep hole) and latest reported status from the following lists:

```
Fresh Water
Heat Flow
Temperature Gradient
```

```
Abandoned
Injection
Observation
Producibile
Idle
Potential Producer
Test
```

California - Mono County

Figure 13. Example of a Well Locations Report

REC#	WELL NAME	OWNER	TYPE	AREA	MER	TWNSHP	RANGE	SEC	EXACT LOCATION
396	FALES 1	Magma Power	Producible	Fales Hot Springs	MD	6 N	23 E	24 SE	1800'N 1800'W
212	B 3	Phillips Petroleum	Abandoned		MD	4 N	25 E	21	
210	B 1	Phillips Petroleum	Abandoned		MD	5 N	25 E	32	
274	BRIDGEPORT 1	Magma Power		Bridgeport	MD	5 N	25 E	34 SW	1300'N 2000'E
211	B 2	Phillips Petroleum	Abandoned		MD	4 N	25 E	8	
835	STATE PRC 4572-1 23-1	USGS		North Shore Mono Lake	MD	2 N	26 E	23 NW	600'S 400'E
834	STATE PRC 4397-1 1	USGS	Abandoned	Long Valley Caldera	MD	1 N	27 E	17 SW	262'N 330'E
832	STATE OF CALIF 1	Geothermal Resources	Abandoned	Long Valley Caldera	MD	1 N	27 E	17	
11	CLAY PIT 1	Union Oil	Idle	Long Valley Caldera	MD	3 S	28 E	15 NE	1299'S 499'W
15	WATER WELL 1	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	725'N 1250'E
12	ENDOGENOUS 1	Magma Energy	Producible	Long Valley Caldera	MD	3 S	28 E	32 W4	184'N 656'E
14	MAMMOTH 1	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 N4	1240'N 3035'E
18	ENDOGENOUS 4	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	797'N 883'E
237	BATHRICK 1	Magma Power	Producible	Long Valley Caldera	MD	3 S	28 E	32	
21	CASA DIABLO 1	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	597'N 495'E
20	ENDOGENOUS 7	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	971'N 531'E
19	ENDOGENOUS 6	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	1191'N 1788'E
13	ENDOGENOUS 2	Magma Energy	Producible	Long Valley Caldera	MD	3 S	28 E	32 W4	515'N 430'E
22	ENDOGENOUS 5	Magma Energy	Abandoned	Long Valley Caldera	MD	3 S	28 E	32 W4	889'N 719'E
17	ENDOGENOUS 3	Magma Energy	Producible	Long Valley Caldera	MD	3 S	28 E	32 W4	866'N 157'E
1	MAMMOTH 1	Union Oil	Idle	Long Valley Caldera	MD	3 S	28 E	32 NW	1601'S 1749'E
16	CHANCE 1	Magma Power	Abandoned	Long Valley Caldera	MD	3 S	28 E	35	
1232	CA-963 66-29	Republic Geothermal		Long Valley Caldera	MD	3 S	29 E	SE	1451'N 1809'W
628	LV-19	Chevron USA	Temperature Gradient Observation	Long Valley Caldera	MD	3 S	29 E	10	
146	5	Chevron USA		Long Valley Caldera	MD	3 S	29 E	17	
1508	LV-17	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	17	
1440	LV-5	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	17	
1441	LV-8	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	18	
150	8	Chevron USA		Long Valley Caldera	MD	3 S	29 E	18	
201	ALMEDIA 1	F. Bauchwitz	Abandoned	North Shore Mono Lake	MD	3 N	29 E	19	
1442	LV-1	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	19	
1507	LV-9	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	19	
1510	LV-20	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	4 S	29 E	2	
1443	LV-16	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	20	
1444	LV-23	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	20 SW	1230'N 1843'E
1445	LV-6	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	21	
1446	LV-7	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	21	
148	6	Chevron USA		Long Valley Caldera	MD	3 S	29 E	21	
1515	LV 3	Republic Geothermal	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	28	
1514	LV 2	Republic Geothermal	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	28	
1519	LV 7	Republic Geothermal	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	28	
1437	LV-4	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	28	
1447	LV-3	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	28	
1513	LV 1	Republic Geothermal	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	29	
1435	LV-2	Chevron USA	Temperature Gradient	Long Valley Caldera	MD	3 S	29 E	29	

3.14. WELL NAMES REPORT

This protocol will assist you in printing a Well Names Report. The report lists all U. S. geothermal wells, by well name, giving: well name, state, county, geothermal area, location (township, range and section), well owner, type, dates spudded and completed, and depth.

To initiate the protocol, type:

```
..WELL.NAMES medium, selection
```

'Selection' may be ALL, USER, STATE, COUNTY, or AREA.

Examples:

1. To list all wells at East Mesa on the printer:

```
..WELL.NAMES PRINTER AREA  
:Areas? EAST MESA
```

2. To report on all California and Nevada wells offline:

```
..WELL.NAMES O, STATE  
:States? CA, NEV ADA
```

3. To list wells in Lake County, Oregon, on the terminal:

```
..WELL.NAMES TERMINAL COUNTY  
:State? ORE  
:Counties? LAKE
```

Figure 14. Example of a Well Names Report

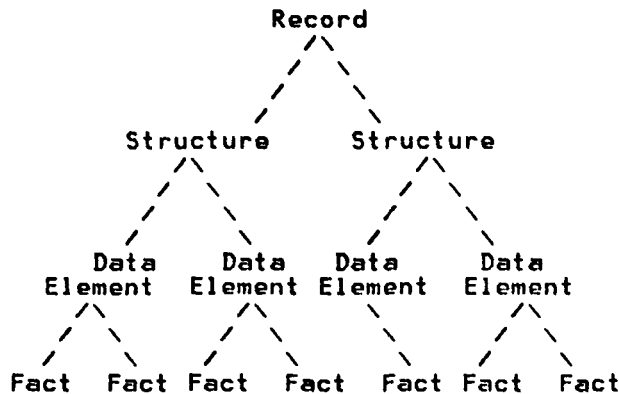
WELL NAME	STATE COUNTY	AREA	TWN	RNG	SECT	OWNER	TYPE	SPUDED	COMPLETED	DEPTH (ft)
A	NV Churchill		16 N	29 E	32	Occidental Geothermal	AG	08/26/78		
A 1	OR Harney		33 S	35 E	20	Al-Aquitaine Exploration	AG	01/20/76		
A 11	OR Harney		33 S	35 E	34	Al-Aquitaine Exploration	AG	01/26/76		
A 2	OR Harney		33 S	35 E	17	Al-Aquitaine Exploration	AG	02/08/76		
A 3	OR Harney		33 S	35 E	29	Al-Aquitaine Exploration	AG	02/09/76		
A 4	OR Harney		33 S	35 E	21	Al-Aquitaine Exploration	AG	02/03/76		
A 5	OR Harney		33 S	35 E	28	Al-Aquitaine Exploration	AG	01/31/76		
A 5A	OR Harney		33 S	35 E	28	Al-Aquitaine Exploration	AG	02/05/76		
A 6	OR Harney		33 S	35 E	15	Al-Aquitaine Exploration	AG	02/09/76		
A 7	OR Harney		33 S	35 E	15	Al-Aquitaine Exploration	AG	02/11/76		
A 8	OR Harney		33 S	35 E	22	Al-Aquitaine Exploration	AG	01/25/76		
A 8	CA Lake	Sulphur Bank Mine	13 N	7 W	9	Chevron Oil	A			
A 9	OR Harney		33 S	35 E	27	Al-Aquitaine Exploration	AG	01/27/76		
A 9A	OR Harney		33 S	35 E	27	Al-Aquitaine Exploration	AG	02/07/76		
A-26	OR Harney		34 S	34 E	29	Anadarko	O		02/15/79	
A-31	OR Harney		34 S	34 E	34	Anadarko	A			
A-34	OR Harney		35 S	34 E	8	Anadarko	A			
A-5	OR Harney		33 S	36 E	6	Anadarko	O		02/15/79	
A-6	OR Harney		33 S	36 E	7	Anadarko	O		02/15/79	
A-7	OR Harney		33 S	36 E	18	Anadarko	A			
A-8	OR Harney		33 S	35 E	14	Anadarko	A			
ABEL 1	CA Lake	The Geysers	11 N	8 W	26	Burmah Oil & Gas	P	04/14/74	06/19/74	7,188
ACCOMAC/TASLEY 55	VA Accomack					Gruy Federal	O	11/26/78	11/28/78	1,034
ACORD 1-26	UT Beaver	Roosevelt Hot Springs	26 S	10 W	26	Mcculloch Geothermal	S	03/31/79	08/01/79	12,648
AIDLIN 1	CA Sonoma	The Geysers	11 N	9 W	4	Aminoil USA	P	10/15/76	02/27/77	8,629
AIDLIN 2	CA Sonoma	The Geysers	12 N	9 W	32	Aminoil USA	S	09/24/77	1977	10,551
AIDLIN 3	CA Sonoma	The Geysers	12 N	9 W	32	Aminoil USA	S	04/01/78	07/24/78	8,960
AIDLIN 4	CA Sonoma	The Geysers	12 N	9 W	32	GRI Operator				
ALAMO CANYON 1	NM Sandoval	Redondo Creek	20 N	3 E	35	Union Oil	P	07/21/79	09/17/79	7,402
ALICE C. PLANTATION 2	LA St. Mary	Garden City	16 S	10 E	2	Gruy Federal	A	08/08/78	09/17/78	16,234
ALMEDIA 1	CA Mono	North Shore Mono Lake	3 N	29 E	19	F. Bauchwitz	A			
AMAX 1	CA Napa	Calistoga Hot Springs	10 N	6 W	29	Amax Exploration	A	08/04/78	11/08/78	8,757
AMBOY STRAT TEST 1	CA San Bernardino		7 N	11 E	21	Phillips Petroleum	GO	09/28/79	10/11/79	2,005

4. STRUCTURE OF THE DATABASE

The analysis of geothermal energy development described in [1] led us to believe that many thousands of facts could be collected to assist in assessing and monitoring the progress of geothermal development. Typical facts are: the depth of well THORNE-7 at the Geysers, the date of a particular lease sale, the number of a particular NOI permit for East Mesa, and the name of the company owning lease number CA 956.

Such a large collection of facts requires organization to be manageable. First, we abstract from the collection of facts to obtain a collection of data elements, or variables. Next, related data elements are aggregated to form a hierarchy of structures. Structures are combined into records of different activities.

Thus organized, the database can facilitate retrieval, manipulation, reporting, and understanding of facts about geothermal development.



4.1. DATA ELEMENTS

Examination of the facts and events that describe geothermal development reveals that the data can be divided into classes so that the facts in each class are occurrences of a single concept. For example, all lease numbers are grouped together in one class, all well depths in another, and all plant names in a third. Each such class is given a name (lease number, well depth, plant name) descriptive of the class. These classes are termed data elements, and the process of determining them is fundamental to the organization of the database.

The process requires judgment at each step. Should one group all plant names together, or should the names of electric power plants form one group, while the names of direct use facilities form another? These decisions must be made consistently across the collection of facts, and the result determines what kinds of aggregations are possible. We have currently identified over 400 such data elements. The exact number can be expected to fluctuate as the system evolves, and experience with the database enables us to improve our decisions.

4.2. RECORDS

Data elements can be aggregated into records which describe the various entities involved in geothermal development. Such entities are: leases, wells, plants, laws, literature references, and so forth. As with the

process of identifying data elements, the process of identifying records, and assigning data elements to records, is a matter of judgment. The result determines, to a considerable extent, how the database can be used, and even what questions are meaningful to it.

We have identified fourteen records that describe geothermal development. They are:

NAME AND ADDRESS	LAND ACQUISITION
PERMIT	POWER PLANT
LEASE	DIRECT USE FACILITY
AREA DESCRIPTION	ENVIRONMENT
GEOHERMAL WELL	LAWS AND REGULATIONS
EXPLORATORY SURVEY	DEVELOPMENT ISSUES
RESOURCE EVALUATION	REFERENCE

The Name and Address Records give selected identifying facts about organizations active in geothermal development. An "organization" may be a governmental agency, a private company, or an individual. The record gives addresses and phone numbers, an indication of the organization size, and the roles played by the organization (such as land owner, lease holder, operator, etc.). Space is provided for a bibliographic reference.

The Permit Records describe permits: NOI's, APD's, POO's, Siting Licenses, Building Permits, and any other federal, state, or local permits required for geothermal exploration and development. Data elements include: permit number (if any) and type, names of applicants and approval agencies, associated EA/EAR numbers, relevant dates, a description of the activities permitted, and a reference.

The Lease Records describe leases, be they federal, state, local, Indian, or private. The record gives the lease number, lease holder and land owner, location of the land, land size, relevant dates and costs, and a reference.

The Area Description Records give general descriptive information about the area. Data elements describe the location of the area, size (by type of land owner), classification, geography, physical and legal attributes, and references.

The Geothermal Well Records describe wells, and include the well name and location, associated permit numbers, well owner, relevant dates and costs, summary of well logs, physical and chemical properties of the geothermal fluid, and references.

The Exploratory Survey Records describe initial surveys of the areas, including survey type, operator, dates and permit numbers, a sketch of the results, and a reference.

The Resource Evaluation Records give the results of formal area evaluations. The record gives evaluator name, date, values for typical parameters, and a reference.

Land Acquisition Records describe leasing events. Both noncompetitive and competitive leasing can be described. Data elements include: names, dates, locations, bidding data, and references.

Power Plant Records describe electric power plants. Data elements give plant name, type of use, relevant dates, geothermal fluid characteristics, site selection details, construction and operating costs, some startup and production details, and references.

Reference Records describe references to data reported in other records, giving title, authors, and source.

The Direct Use, Environment, Development Issues, and Laws and Regulations records are in the process of being defined and reviewed, and are

therefore not included in the appendix.

4.3. STRUCTURES

There is a level of aggregation that falls between data elements and records, called structure. Many levels of structure may exist within a record. Their purpose is to allow elements in a record that are related to be grouped together. For example, all of the elements that describe the location of a well (township, range, section, etc.) can be grouped together into a LOCATION structure, and referred to by a single name ("LOCATION"). Indeed, this terminology has already been used in the record descriptions given in the last section.

An important function of structures is to group related instances of multiply occurring elements. Many elements in an instance of a record are restricted to single occurrences - a particular lease has only one lease number, and is of only one type, for example. Other elements may occur more than once. For example, several companies may share the ownership of some lease - each such company is designated by one instance of the lease holder data element in the lease record.

In other cases, instances of multiply-occurring elements are related. Data elements for an address, in the Name and Address Record, include: address line, city, state, zip, country, and phone. If a company has several addresses, say in Phoenix and Seattle, we must be able to associate city Phoenix with state Arizona, and Seattle with Washington. This is done by grouping the elements into an address structure, and allowing the structure to be multiply occurring. In the example, address line and phone number are each multiply occurring elements within the multiply occurring structure. Here is a more complete example, of a fictitious company:

NAME	Pacific Geothermal Conglomerate
ADDRESS	
ADDRESS LINE	77 Maritime Plaza
CITY	San Francisco
STATE	California
ZIP	94111
PHONE	(415) 956-1234
PHONE	(415) 956-4312
ADDRESS	
ADDRESS LINE	Field Office
ADDRESS LINE	Third State Bank Building
ADDRESS LINE	Suite 4771
CITY	New York
STATE	New York
ZIP	10019
PHONE	(212) 922-9876

Components of structures may be either data elements or other structures. Thus, a rather sophisticated hierarchical organization is possible, as can be seen in the appendix.

Although all this seems rather detailed, it is intended to simplify the user's task. For example, a complete address may be obtained by the single command TYPE ADDRESS, while searching may restrict a list of addresses to those organizations located in a particular city or state, or the user may order a listing by zip code.

4.4. GEOHERMAL RESOURCE AREAS

The entire GRAD database is organized around the concept of a Geothermal Resource Area (or Area, for short). This is defined to be an expanse of land associated with a geothermal reservoir that is used, or might be used, for the industrial development of that reservoir.

An area is intended to reflect real developments, and thus will change as development progresses. At any particular time, it is reasonably well defined (albeit with some ambiguity at the edges), but may grow or shrink as knowledge of the reservoir improves, and development proceeds.

How, then, is an area delineated? It's a matter of judgment, based on the available evidence concerning both geology and human activities. We take the following items into account, whenever they apply:

- . The extent of the reservoir.
- . KGRA boundary lines.
- . Current and past leasing activity.
- . Well drilling activity.
- . Plant construction activity.
- . Usage and designation by federal or state agencies.

In some areas (such as The Geysers in California) most of the items in the list apply, and reasonably clear area boundaries can be drawn. In other areas, only vague knowledge of the reservoir exists, and no development has taken place, so the boundaries are known only imprecisely. As development of such a reservoir proceeds, the boundary will become better known.

4.5. DETAILED RECORD STRUCTURE

Details of record structures are not necessary for report production. They are necessary for direct interrogation of the database, and are, therefore, described briefly here. The best way to become familiar with the contents of the database is to use the query language and browse around.

A SPIRES record consists of a hierarchically organized collection of structures and elements [2], with the following properties:

Element name. Each element and each structure has a name.

Alias name. An element or structure may have one or more alternate names, called aliases. Typically, an alias is a 1-3 character abbreviation of the full name.

Occurrence count. The number of occurrences that an element or structure may have in a record may be limited. In the GRAD system, an element (or structure) may occur exactly once, may occur zero or one time, may occur one or more times, or may occur zero or more times.

Index name. Elements may be indexed, to provide for rapid retrieval; indices are named, and may have alternate names.

Record key. Each record has a unique key that identifies the record occurrence from all other occurrences of that record type. The key may be a meaningful element (such as AREA-NAME or PLANT-NAME), or an arbitrary system-assigned integer. The record key is the first element of the record.

All records in the GRAD system contain certain elements used for administrative control. DATE-ADDED and DATE-UPDATED contain the dates upon which the record was first entered into the database, and last changed. Structure HISTORY-OF-RECD records major update activity, giving date, staff name, and a brief description of the activity. REF-CODE refers to the key of a record in the REFERENCE portion of the database.

Tables giving element, alias and index names, and occurrence bounds are given in the appendix for some of the record types: ADDRESS, AREA DESCRIPTION, PERMIT, LEASE, WELL, PLANT, REFERENCE, and AREA SUMMARY. Since the database contains little or no data for the other record types, their descriptions are not yet useful here.

5. USING THE QUERY LANGUAGE

The SPIRES query language can be used for direct interrogation of the database. A full description is given in References 3 and 4; the discussion here is intended to serve as an introduction to the references.

The computer system will always let you know when it is ready for a command, by typing the prompt '->' on the terminal. Each command is completed by the RETURN key; do not try to type anything after you press RETURN until the prompt appears.

A special key on the terminal is the BREAK (or ATTN) key; it acts as an interrupt. If you wish to cancel an input line before you press RETURN, or if you wish to terminate the execution of a command (such as TYPE), press BREAK.

5.1. THE QUERY PROCESS

There are five steps that must be carried out to obtain information directly from the database:

1. Select the portion of the database (called a subfile) you wish to interact with. This step must precede the remaining ones.
2. Set an output format. A default format is established in step 1 by the computer system, so this step may be omitted. The format may be set at any time after step 1 and before step 5.
3. Find a set of records to display.
4. Sequence the records into a desired order. This step is optional, and is usually omitted if the order of display doesn't matter.
5. Type out the results.

The steps may be repeated, by re-entering the sequence at any point. Thus, for example:

1. SELECT WELL
3. FIND STATE = CALIFORNIA
4. SEQUENCE WELL-OWNER
5. TYPE
4. SEQUENCE COUNTY WELL-NAME
2. SET FORMAT WELL LIST
5. TYPE
3. FIND WELL-TYPE = INJECTION
5. TYPE WELL-NAME WELL-OWNER

In the remaining portions of this section, we discuss each step briefly, and conclude with a description of the commands available to help you control your terminal environment.

5.2. SELECTING A SUBFILE

Before you may ask SPIRES questions about the GRAD database, you must tell the system which portion you are interested in. This is done by the SELECT command:

```
SELECT <subfile-name>
```

The subfile name can be found in the appendix. Examples are:

SELECT WELL
SELECT AREA SUMMARY

Once selected, the subfile remains in effect until a new one is selected. There is no limit to the number of times the command may be issued during a terminal session.

5.3. SETTING A FORMAT

A default format is established by the SELECT command, and you may use it if you like. This default format will cause most of the elements within the record to be displayed.

Some subfiles allow alternate formats; the command is:

```
SET FORMAT <format-name>
```

For example:

```
SET FORMAT STDOUT  
SET FORMAT WELL LIST
```

You may also define your own format, using the DEFINE TABLE command (see [4] for details). Arguments are the names of elements you wish to include in the output. Options are available for specifying column position and length, calculations, etc. For example:

```
DEFINE TABLE WELL-NAME WELL-TYPE LEASE-NUMBER
```

5.4. FINDING A SET OF RECORDS TO DISPLAY

A set of records to display may be found by using an index to the subfile, or by searching the subfile (or a portion of it) sequentially. (The latter is not discussed here.) The elements that are indexed, and the names of the indices, are shown in the appendix. For example, well records are indexed by date last updated, well name, APD number, well owner, etc. Usually, an index may be specified by several names. In all cases, the element name may be used (and therefore is not listed under INDEX NAME in the appendix); alternate names are shown in the appendix. For example, the well owner index may be referred to as W0, OWNER, or WELL-OWNER.

Indices are interrogated by the FIND command. Response is to print the number of records that satisfy the command. The command is:

```
FIND <logical-expression>
```

The expression is built up from simple conditions of the form '<element-name> <relation> <value>'. The relation may be =, !=, >, >=, <, or <=. If the relation is omitted, = is assumed. Examples are:

```
FIND W = CUTTER 1  
FIND OWNER UNION OIL      [= is assumed here]  
FIND DU > 7/3/80  
FIND STATE < NEVADA
```

Simple conditions may be combined by AND, OR, and AND NOT; parentheses may be used for grouping.

```
FIND (ST = CA AND CY = LAKE) OR (ST = ORE AND NOT WT I)
```

Results of a FIND may be further modified by entering additional conditions:

```
-> FIND STATE = CA
```

```
832 WELL(S)
-> AND (COUNTY = LAKE OR SONOMA)
327 WELL(S)
```

This discussion barely begins to describe FIND; you are encouraged to experiment, and to consult the references.

5.5. SEQUENCING THE RECORDS

If desired, records may be sorted before being displayed. The command is:

```
SEQUENCE <element-list>
```

The element list contains the names of one or more elements. Default sequence is ascending; descending sequences may be obtained by adding '(D)' to the element name. For example:

```
SEQUENCE WELL-NAME
SEQUENCE STATE COUNTY(D) WELL-TYPE
```

An element containing character data is sorted into lexicographic order (A-Z) if ascending is requested; reverse lexicographic order for descending. An element containing numeric data is sorted into increasing order (1 to 10 to 400) if ascending is requested, and into decreasing numeric order for descending.

5.6. DISPLAYING THE RESULTS

The set of records selected by the FIND command, and possibly sorted by the SEQUENCE command, may be displayed using the specified format by entering

```
TYPE
```

It is also possible to override the format and display the values of selected elements by

```
TYPE <element-list>
```

Just give the names of the elements you wish displayed. For example:

```
TYPE WELL-NAME LOCATION
```

5.7. CONTROLLING THE ENVIRONMENT

A large number of commands are available to discover what your session environment is, and to change it. The list below gives only a few of these. SHOW commands display status information, and SET commands change session characteristics.

SHOW CHARGES	Gives accounting information (updated nightly).
SHOW ELEMENTS	Lists names of all elements in current subfile.
SHOW FILESIZE	Displays number of records in current subfile.
SHOW FORMATS	Displays names of formats available with current subfile, and which is set.

REFERENCES

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2. SPIRES/370 File Definition. Forsythe Computer Center, Stanford University, Stanford, CA (October 1979).
3. A Guide to Searching -- a SPIRES Primer. Forsythe Computer Center, Stanford University, Stanford, CA (Feb. 1980).
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5. Getting Started at the Campus Facility. Stanford Center for Information Processing, Stanford University, Stanford, CA (September 1977).
6. Telenet Use at Stanford. Brochure # 351, Stanford Center for Information Processing, Stanford University, Stanford, CA (April 1978).
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APPENDIX. GRAD RECORD DEFINITIONS

This appendix contains tables describing the various active record types in GRAD - that is, record types for which data exists in the database. Each section contains four tables, giving record structure properties, subfile names, format names, and report protocol names. Details contained in these tables are necessary for extensive use of the query facility; they are not needed for report production as explained in Section 2.

1. ADDRESS RECORD

Element Name	Alias	Occ	Index Name	Notes
NAME-CODE	NC	1	N, NAME	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
NAME	N	0,1	N	
ADDRESS	AD	0+		
ADDRESS-LINE	AL	0+		
CITY	C	0,1		
STATE	ST	0,1	ST	2
ZIP	Z	0,1		
COUNTRY	CTY	0,1		2,3
PHONE	P	0+		
TYPE-OF-ORG	TO	0,1	TO, ORG	2
ORG-SIZE	OS	0,1		2
PRIN-ROLE	PR	0+	PR, ROLE	2
REFERENCE	RF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARKS	RM	0+		
HISTORY-OF-RECD	HR	0+		
DATE-OF-ACTIVITY	DY	1		
STAFF-NAME	STF	1		2
ACTION	AC	1		

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.
3. Defaults to 'US'.

Subfile name	Purpose
ADDRESS	Primary access to Address record.
NAME INDEX	Access to Name Index records.

Format name	Purpose
ADDRESS	Print contents of ADDRESS records at a terminal, or on a printer.
STDOUT	Print contents of records in SPIRES input format.

Protocol name	Purpose
ADDRESS.LIST	Formatted listing of Address records.

2. AREA DESCRIPTION RECORD

Element name	Alias	Occ	Index name	Notes
AREA-CODE	ACO	1	A, AREA	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
AREA	A	0+	A	
STATE	ST	0,1	ST	2
COUNTY	CY	0+	CY	
LATITUDE	LAT	0,1		
LONGITUDE	LON	0,1		
MERIDIAN	M	0,1		
LOCATION	LOC	0+		
TOWNSHIP	T	0,1		
RANGE	R	0,1		
SECTION	SE	0+		
SIZE-FEDERAL	SZF	0,1		
SIZE-STATE	SZS	0,1		
SIZE-COUNTY	SZC	0,1		
SIZE-LOCAL	SZL	0,1		
SIZE-INDIAN	SZI	0,1		
SIZE-PRIVATE	SZP	0,1		
SIZE	SZ	0,1		
CLASSIFICATION	CL	0+		
CLASS	CLS	0,1		2
DATE		0,1		
REMARK	KRM	0+		
TERRAIN	TE	0+		2
LAND-USE	LU	0+		2
GEO-HAZARDS	GH	0+		2
STORM-HAZARDS	SH	0+		2
TEMP-RANGE	TR	0,1		
MIN-TEMP	MNT	0,1		
MAX-TEMP	MXT	0,1		
WET-BULB-RANGE	WB	0,1		
MIN-WET-BULB	MNW	0,1		
MAX-WET-BULB	MXW	0,1		
PRECIPITATION	PCP	0+		
AMOUNT	AM	0,1		
FORM	F	0,1		2
REMARK	PRM	0+		
CLIMATE-REMARK	CRM	0+		
NEARBY-CITIES	NCS	0+		
CITY	C	0,1		
POPULATION	POP	0,1		
DIST-TO-AREA	DIS	0,1		
REMARK	NRM	0+		
MARKETS	MR	0+		
MARKET-TYPE	MK	0,1		2
REMARK	MRM	0+		
ACCESS-TO-AREA	ACC	0+		
WATER-SUPPLY	WS	0+		
SOURCE	SO	0,1		
FLOW-RATE	FR	0,1		
SALINITY	SY	0,1		
PROXIMITY	PX	0,1		
REMARK	WRM	0+		
POWER-LINES	PL	0+		
PROXIMITY	PX	0,1		
CAPACITY	CP	0+		
NUMBER-OF-LINES	NL	0,1		
VOLTAGE	VL	0,1		
REMARK	LRM	0+		
IMPROVEMENTS	I	0+		
OWNERSHIP	OWN	0+		
RIGHTS-OWNED	RO	0+		2
OWNER	OW	0+		
CONTROL-AUTH	CA	0+		

JURISDICTION	J	0,1	2
AUTHORITY	AU	0+	
REFERENCE	RF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARKS	RM	0+	
HISTORY-OF-RECD	HR	0+	
DATE-OF-ACTIVITY	DY	1	
STAFF-NAME	STF	1	2
ACTION	AC	1	

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.

Subfile name	Purpose
AREA	Primary access to Area record.
AREA INDEX	Access to Area Index records.

Format name	Purpose
STDOUT	Print contents of records in SPIRES input format.

Protocol name	Purpose
---------------	---------

3. PERMIT RECORD

Element name	Alias	Occ	Index name	Notes
RECORD-NUMBER		1		1
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
PERMIT-NUMBER	PN	0,1	PN, PERMIT	
PERMIT-TYPE	PT	0+	PT, TYPE	2
AREA	A	0+	A	
APPLICANT-NAME	AN	0+	AN, APPLICANT	
APPROVING-AGENCY	AA	0+	AA, AGENCY	
LEASE-NUMBER	L	0+	L, LEASE	
EA-STRUC	ES	0+		
EA-NUMBER	EN	0,1		
EA-DATE	ED	0,1		
EAR-STRUC	ERS	0+		
EAR-NUMBER	ERN	0,1		
EAR-DATE	ERD	0,1		
DATE-FILED	DF	0+		
DATE-APPROVED	DAP	0+		
DATE-EXPANDED	DE	0+		
DATE-ACTY-BEGAN	DB	0+		
DATE-ACTY-DONE	DAD	0+		
DATE-RCDS-FILED	DR	0+		
ACTIVITY-DESC	ACD	0+		
REFERENCE	RF	0+		
REF-CODE	RC	1		
COMMENT	CM	0,1		
REMARKS	RM	0+		
HISTORY-OF-RECD	HR	0+		
DATE-OF-ACTIVITY	DY	1		
STAFF-NAME	STF	1		2
ACTION	AC	1		

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.

Subfile name	Purpose
PERMIT	Primary access to Permit record.

Format name	Purpose
PERMIT	Print contents of PERMIT records at a terminal, or on a printer.
STDOUT	Print contents of records in SPIRES input format.

Protocol name	Purpose
---------------	---------

4. LEASE RECORD

Element name	Alias	Occ	Index name	Notes
LEASE-NUMBER	L	1	L, LEASE	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
AREA	A	0,1	A	
LEASE-HOLDER	LH	0+	LH	
LEASE-TYPE	LT	0,1	LT	2
LAND-OWNER-TYPE	LOT	0,1	LOT, OWNER-TYPE	2
LAND-OWNER	LO	0+	LO, OWNER	
STATE	ST	0,1	ST	2
COUNTY	CY	0,1	CY	
MERIDIAN	M	0,1		2
LOCATION	LOC	0+		
TOWNSHIP	T	0,1		
RANGE	R	0,1		
SECTION	SE	0+		
SIZE	SZ	0,1		
DATE-ISSUED	DI	0,1		
DATE-TERMINATES	DT	0,1		
DATE-TURNED-BACK	DTB	0,1		
BONUS	B	0,1		
RENT	RT	0,1		
ROYALTY	RY	0,1		
REFERENCE	RF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARKS	RM	0+		
HISTORY-OF-RECD	HR	0+		
DATE-OF-ACTIVITY	DY	1		
STAFF-NAME	STF	1+		2
ACTION	AC	1		
YEAR-LEASED	YL	0,1		3
ACRES-LEASED	ACL	0,1		4
BONUS-PER-ACRE	BPA	0,1		5

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.
3. Derived from DATE-ISSUED.
4. Derived from SIZE - converted to acres.
5. Derived from BONUS and SIZE (converted to acres).

Subfile name	Purpose
LEASE	Primary access to Lease record.

Format name	Purpose
LEASE	Print contents of LEASE records at a terminal, or on a printer
STDOUT	Print contents of records in SPIRES input format.
LEASE SUMMARY	Print a summary of lease data, by area.
LEASE HOLDER	Print a summary of lease data, by lease holder and area.
STATE SUMMARY	Print a summary of leasing, by state.
LHOLDER TOTALS	Print a summary of leasing, by lease holder, year, state, and county.

Protocol name	Purpose
LEASE.DETAIL	Controlled production of LEASE report.
LEASE.HOLDER	Controlled production of LEASE HOLDER report.

LEASE.SUMMARY	Controlled production of LEASE SUMMARY report.
LEASE.HOLDER.TOTALS	Controlled production of LEASE HOLDER TOTALS report.
STATE.SUMMARY	Controlled production of STATE SUMMARY report.

5. WELL RECORD

Element name	Alias	Occ	Index name	Notes
RECORD-NUMBER		1		1
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
WELL-NAME	W	0,1	W, WELL	
AREA	A	0,1	A	
API-NUMBER	API	0+		
APD-NUMBER	APD	0+	APD	
WELL-OWNER	WO	0+	WO, OWNER	
DRILLING-COMPANY	DRC	0+	DRC, DRILLING	
LEASE-NUMBER	L	0+	L, LEASE	
LOCATION	LOC	0,1		
STATE	ST	0,1	ST	2
COUNTY	CY	0,1	CY	
MERIDIAN	M	0,1		
TOWNSHIP	T	0,1		
RANGE	R	0,1		
SECTION	SE	0,1		
CORNER	CR	0,1		2
NS-DISTANCE	NS	0,1		
NS-DIRECTION	NSD	0,1		2
EW-DISTANCE	EW	0,1		
EW-DIRECTION	EWD	0,1		2
DATE-SPUDDED	DS	0,1		
DATE-LOC-FILED	DLF	0+		
DATE-COMPLETED	DC	0,1		
WELL-TYPE	WT	0+	WT, TYPE	2
WELL-COST-DATA	WCD	0+		
COST-DATE	CD	0,1		
WELL-COST	WC	0,1		
REFERENCE	CRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	CRM	0+		
WELL-DEPTH	WD	0,1		
DOWN-HOLE-DATA	DD	0+		
DOWN-HOLE-DATE	DHD	0,1		
PRESSURE-DATA	PD	0+		
DEPTH	D	0,1		
PRESSURE	PRS	0,1		
REFERENCE	DRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	DRM	0+		
WELLHEAD-DATA	WH	0+		
DATE-TESTED	DTS	0,1		
FLOW-DATA	FD	0+		
PRESSURE	PRS	0,1		
TEMPERATURE	TP	0,1		
MASS-FLOW-RATE	MFR	0,1		
VOL-FLOW-RATE	VFR	0,1		
REFERENCE	WRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	WRM	0+		
TEMPERATURE-DATA	TD	0+		
TEMP-DATE	TDE	0,1		
TEMP-DATA	TDA	0+		
DEPTH	D	0,1		
TEMPERATURE	TP	0,1		
REFERENCE	TRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	TRM	0+		
WELL-LOGGING	WL	0+		
LOG-COMPANY	LGC	0,1		

LOG-TYPE	LGT	0+	2
REMARK	LRM	0+	
DRILLING-INFO	DRI	0+	
MUD-TYPE	MT	0+	
DRILL-PROBLEM	DP	0+	
WELL-CASING	CS	0+	
CASING-DIAMETER	CDI	0,1	
CASING-DEPTH	CDE	0,1	
CASING-TYPE	CT	0,1	
SLANT-WELL	SW	0,1	2
STIM-DEPTH	STD	0+	
REFERENCE	DRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	DRM	0+	
NCG-CONTENT	NCG	0+	
NCG-DATE	ND	0,1	
NCG-VOL	NV	0,1	
NCG-WT	NW	0,1	
GAS-DATA	GAS	0+	
GAS-DATE	GD	0,1	
GAS-MSRMT	GM	0+	
GAS-CHEMICAL	GCH	0,1	
PERCENT-OF-GAS	PG	0,1	
REFERENCE	GRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	GRM	0+	
FLUID-DATA	FLD	0+	
FLUID-DATE	FDE	0,1	
SAMPLE-DEPTH	SD	0,1	
INSTRUMENTATION	IN	0+	
PH		0,1	
DISSOLVED-SOLIDS	TDS	0,1	
FLUID-MSRMT	FM	0+	
FLUID-CHEMICAL	FC	0,1	
AMOUNT	AM	0,1	
REMARK	FRE	0+	
REFERENCE	FRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	FRM	0+	
REFERENCE	RF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
GENERAL-REMARK	RM	0+	
HISTORY-OF-RECD	HR	0+	
DATE-OF-ACTIVITY	DY	1	
STAFF-NAME	STF	1	2
ACTION	AC	1	
YEAR-SPUDDDED	YRS	0,1	3
YEAR-COMPLETED	YRC	0,1	4
WELL-FOOTAGE	WF	0,1	5

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.
3. Derived from DATE-SPUDDDED.
4. Derived from DATE-COMPLETED.
5. Derived from WELL-DEPTH - converted to feet.

Subfile name	Purpose
WELLS	Primary access to Well record.
WELL INDEX	Access to Well Index records.

Format name	Purpose
WELL	Print complete contents of well records.
WELL LIST	Print a table giving well name and owner,

depth, wellhead temperature and pressure, and date completed. Give totals.
 Print contents of records in SPIRES input format.
 Print table of wellhead data.
 Print summary of drilling by state, area, well owner, and year.
 Print exact locations of wells.
 Print well types and depths, summarized by area and year.
 Print well names, locations, types, dates, and depths.
 Same as WELL NAMES, except that Record Number is printed.

Protocol name	Purpose
WELL.DETAIL	Controlled production of WELL DETAIL report.
WELL.FLOW	Controlled production of WELL FLOW report.
WELL.DATA	Controlled production of WELL D ATA report.
WELL.FOOTAGE	Controlled production of WELL FOOTAGE report.
WELL.LOCATIONS	Controlled production of WELL LOCATIONS report.
WELL.NAMES	Controlled production of WELL NAMES report.
WELL.DEPTH	Controlled production of WELL DEPTH report.

6. PLANT RECORD

Element name	Alias	Occ	Index name	Notes
PLANT-NAME	PLN	1	PLN, PLANT	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
AREA	A	0,1	A	
LOCATION	LOC	0,1		
STATE	ST	0,1	ST	
COUNTY	CY	0,1	CY	
MERIDIAN	M	0,1		2
TOWNSHIP	T	0,1		
RANGE	R	0,1		
SECTION	SE	0,1		
CORNER	CR	0,1		2
NS-DISTANCE	NS	0,1		
NS-DIRECTION	NSD	0,1		2
EW-DISTANCE	EW	0,1		
EW-DIRECTION	EWD	0,1		2
FLUID-SUPPLIER	FS	0+	FS	
UTILITY	UT	0+	UT	
OPERATING-CHAR	OC	0,1		
PLANT-TYPE	PT	0,1		
SECONDARY-FLUID	SF	0+		
GROSS-POWER	GPW	0,1		
NET-POWER	NPW	0,1		
OPERATING-REMARK	ORM	0+		
DSGN-FLUID-DATA	FLD	0+		
INLET-TEMP	IT	0,1		
INLET-PRESSURE	IP	0,1		
MASS-FLOW-RATE	MFR	0,1		
VOL-FLOW-RATE	VFR	0,1		
ENTHALPY	ENT	0,1		
OTHER	FDO	0+		
DSGN-PERFORMANCE	PER	0,1		
GENERATOR-ELEC	GE	0,1		
AUXILIARY-ELEC	AE	0,1		
NET-UNIT-OUTPUT	NUO	0,1		
DESIGN-REMARK	DRM	0+		
PRODUCER-COSTS	PDC	0+		
CAPITAL	CAP	0,1		
O-M	OM	0,1		
BASE-YEAR	BY	0,1		
UTILITY-COSTS	UC	0,1		
CAPITAL	CAP	0,1		
O-M	OM	0,1		
BASE-YEAR	BY	0,1		
BUSBAR-COST	BC	0,1		
COST-REMARK	CRM	0+		
STATUS	STS	0,1		2
DATE-ON-LINE	DOL	0,1		
PERMIT	PMT	0+		
PERMIT-TYPE	PT	0,1		
DATE-FILED	DF	0,1		
DATE-APPROVED	DAP	0,1		
PERMIT-REMARK	PRM	0+		
DATE-CONST-BEGAN	DCB	0,1		
DATE-CONST-DONE	DCD	0,1		
CONST-REMARK	CTRM	0+		
STARTUP-PROBLEM	SP	0+		
STARTUP-REMARK	SRM	0+		
DATE-COMM-PROD	DCP	0,1		
COMM-PROBLEM	CMP	0+		
OPERATING-DATA	OD	0,1		
CONNECTING-WELL	CW	0+		
WELL-NAME	W	0,1		
WELL-TYPE	WT	0,1		2
OPERATING-REMARK	ORM	0+		

REFERENCE	RF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARKS	RM	0+	
HISTORY-OF-RECD	HR	0+	
DATE-OF-ACTIVITY	DY	1	
STAFF-NAME	STF	1+	2
ACTION	AC	1	

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.

Subfile name	Purpose
PLANT	Primary access to electric plant record.

Format name	Purpose
STDOUT	Print contents of records in SPIRES input format.

Protocol name	Purpose
---------------	---------

7. REFERENCE RECORD

Element name	Alias	Occ	Index name	Notes
REF-CODE	RC	1	RC	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
AUTHOR	AUT	0+	AUT	
TITLE	TI	0+		
SOURCE	SO	0+		
DOC-NBR	DNB	0+		
REMARKS	RM	0+		
HISTORY-OF-RECD	HR	0+		
DATE-OF-ACTIVITY	DY	1		
STAFF-NAME	STF	1		2
ACTION	AC	1		

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.

Subfile name	Purpose
REFERENCE	Primary access to Reference record.

Format name	Purpose
STDOUT	Print contents of records in SPIRES input format.
REFERENCE	Print contents of REFERENCE records in an attractive format.

Protocol name	Purpose
REFERENCE.LIST	Controlled production of REFERENCE report.

8. AREA SUMMARY RECORD

The Area Summary Record contains information about the current development status of each area, for use in the Area Status and Current Status Reports.

Element name	Alias	Occ	Index name	Notes
AREA	A	1	A	
DATE-ADDED	DA	1		1
DATE-UPDATED	DU	1	DU, UPDATED	1
ALT-AREA-NAME	AAN	0+	A, AREA	
KGRA-NAME	KN	0+	A, AREA	
AREA-PROP	AP	0,1		
STATE	ST	0,1	ST	2
COUNTY	CY	0+	CY	
STATUS	STS	0,1		2
MARKETS	MR	0+		
MARKET-TYPE	MK	1		2
SERVICE-AREA	SA	0+		
TOTAL-SIZE	TSZ	0,1		
RESOURCE-PROP	RP	0,1		
MEAN-DEPTH	MED	0,1		
MIN-DEPTH	MND	0,1		
MAX-DEPTH	MXD	0,1		
MEAN-THICKNESS	ETH	0,1		
MIN-THICKNESS	NTH	0,1		
MAX-THICKNESS	XTH	0,1		
MEAN-AREA	MEA	0,1		
MIN-AREA	MNA	0,1		
MAX-AREA	MXA	0,1		
MEAN-TEMP	MET	0,1		
MIN-TEMP	MNT	0,1		
MAX-TEMP	MXT	0,1		
MEAN-TDS	ETD	0,1		
MIN-TDS	NTD	0,1		
MAX-TDS	XTD	0,1		
VOLUME	VO	0,1		
POWER-POTENTIAL	PWP	0,1		
THERMAL-ENERGY	THE	0,1		
REFERENCE	RRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	RRM	0+		
SURVEY-PROP	SUP	0,1		
SURVEY-TYPE	SVT	0+		2
REFERENCE	SRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	SRM	0+		
LEASING-PROP	LP	0+		
LAND-OWNER-TYPE	LOT	0,1		2
NBR-LEASES	NBL	0,1		
NBR-LHLDRS	NLH	0,1		
AREA-LEASED	ARL	0,1		
AREA-WITHDRAWN	AWD	0,1		
SIZE	SZ	0,1		
BONUS	B	0,1		
RENT	RT	0,1		
ROYALTY	RY	0,1		
REFERENCE	LRF	0+		
REF-CODE	RC	1		
COMMENT	CM	0+		
REMARK	LRM	0+		
DRILLING-PROP	DLP	0+		
WELL-TYPE	WT	0,1		2
NBR-SPUDED	NBS	0,1		
NBR-COMPLETED	NBC	0,1		

NBR-OPERATIONAL	NBO	0,1	
NBR-IDLE-SUSP	NIS	0,1	
NBR-ABANDONED	NBA	0,1	
MEAN-DEPTH	MED	0,1	
MIN-DEPTH	MND	0,1	
MAX-DEPTH	MXD	0,1	
NBR-WELL-DEPTH	NWD	0,1	
MEAN-SFC-TEMP	MET	0,1	
MIN-SFC-TEMP	MNT	0,1	
MAX-SFC-TEMP	MXT	0,1	
NBR-WELL-TEMP	NWT	0,1	
MEAN-SFC-FLOW	MEF	0,1	
MIN-SFC-FLOW	MNF	0,1	
MAX-SFC-FLOW	MXF	0,1	
NBR-WELL-FLOW	NWF	0,1	
REFERENCE	DRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	DRM	0+	
PLANT-PROP	PLP	0,1	
NBR-OP-ELEC	NOE	0,1	
NBR-CONST-ELEC	NCE	0,1	
NBR-PLN-ELEC	NPE	0,1	
OP-ELEC-POWER	OEP	0,1	
CONST-ELEC-POWER	CEP	0,1	
PLN-ELEC-POWER	PEP	0,1	
NBR-OP-DRCT	NOD	0,1	
NBR-CONST-DRCT	NCD	0,1	
NBR-PLN-DRCT	NPD	0,1	
OP-DRCT-POWER	ODP	0,1	
CONST-DRCT-POWER	CDP	0,1	
PLN-DRCT-POWER	PDP	0,1	
REFERENCE	PRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	PRM	0+	
COMPANY-PROP	COP	0,1	
ORGANIZATION	ORG	0+	
ORG-NAME	ON	1	
ROLE		0+	
REFERENCE	CRF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	CRM	0+	
ELECTRIC-PLANT	EP	0+	
PLANT-NAME	PLN	1	PLN, PLANT
PLANT-TYPE	PLN	0,1	
STATUS	STS	0,1	
YEAR-ON-LINE	TOL	0,1	2
FLUID-SUPPLIER	FS	0,1	FS
UTILITY	UT	0,1	UT
GROSS-PWR-OUTPUT	GPW	0,1	
NET-PWR-OUTPUT	NPW	0,1	
CAPITAL-COSTS	CAP	0,1	
BUS-BAR-COST	BC	0,1	
REFERENCE	ERF	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	ERM	0+	
DIRECT-USE-PLANT	DUP	0+	
PLANT-NAME	PLN	1	PLN
STATUS	STS	0,1	
TYPE-OF-USE	TU	0,1	2
YEAR-ON-LINE	YOL	0,1	2
OPERATOR	OPR	0,1	OPR
RATED-PWR-OUTPUT	RPO	0,1	
FED-FUNDS	FF	0,1	
STATE-FUNDS	SF	0,1	
MUNICIPAL-FUNDS	MF	0,1	
PRIVATE-FUNDS	PF	0,1	
DEMO-PROJECT	DMP	0,1	
REFERENCE	DRF	0+	

REF-CODE	RC	1	
COMMENT	CM	0+	
REMARK	DRM	0+	
REFERENCE	RC	0+	
REF-CODE	RC	1	
COMMENT	CM	0+	
REMARKS	RM	0+	
HISTORY-OF-RECD	HR	0+	
DATE-OF-ACTIVITY	DY	1	
STAFF-NAME	STF	1	2
ACTION	AC	1	

Notes:

1. Filled in by SPIRES.
2. Uses a controlled vocabulary.

Subfile name	Purpose
AREA SUMMARY	Primary access to Area Summary record.

Format name	Purpose
STDOUT	Print contents of records in SPIRES input format.
AREA STATUS	Print Area Status Report.
CURRENT STATUS	Print Current Status Report.
RESOURCE	Print Resource Characteristics Report.

Protocol name	Purpose
AREA.STATUS	Produce Area Status Report.
RESOURCE	Controlled production of Resource Characteristics report.