Bureau of Mineral Resources, Geology & Geophysics

R E C O R D

BMR RECORD 1990/19

User's Guide to the

PetChem DataBase

by

R.J. Ryburn

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07/03/90

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1 - INTRODUCTION

PetChem is a repository for major and trace element chemical analyses of Australian rocks and is part of a wider database for information on BMR rock samples and the laboratory data derived from them. It includes some data sourced outside BMR and some samples collected outside Australia. This guide is mainly concerned with the chemical data, although the sample location and storage aspects of the Sample Database are also described in some detail. Documents on other branches of the wider database, such as geochronology, are being prepared separately.

Although the initial design of PetChem was constrained by a mass of pre-existing data, the structure of the database has been improved as the data was cleaned and systematised. The design of the database, as outlined in this guide, should be regarded as a plateau rather than the final destination. The relational nature of the database and the use of Oracle as the database management system should ensure that the database remains flexible, expandable and portable. The database will be easily transferred to other hardware and/or software when this becomes necessary in the future.

2 - THE RELATIONAL MODEL

A relational database is one in which the data can be thought of as residing in two-dimensional tables, with horizontal rows and vertical columns. The columns consist of named fields, generally of fixed lengths, accommodating numbers, text or dates. The rows are records, usually identified by a unique key of some kind. Tables are related to one another by data items in common and there are no predefined links between tables. Thus a row in one table may share the same data items as a row in another table - for example, the SAMPLES, MAJORS and TRACES tables in PetChem all include sample numbers. An item in one table may be repeated many times in another - a sample can have many major-element analyses.

The strengths of the relational model are its conceptual simplicity, flexibility and inherent data integrity. The links between tables are not 'hard-wired' into the structure of the database, so that all conceivable retrievals are theoretically possible. On the negative side, a highly normalised relational database can have so many tables that the commands required to retrieve data become unduly complicated. Also, the performance of a relational database tends to suffer in comparison with a database that has been built using a procedural

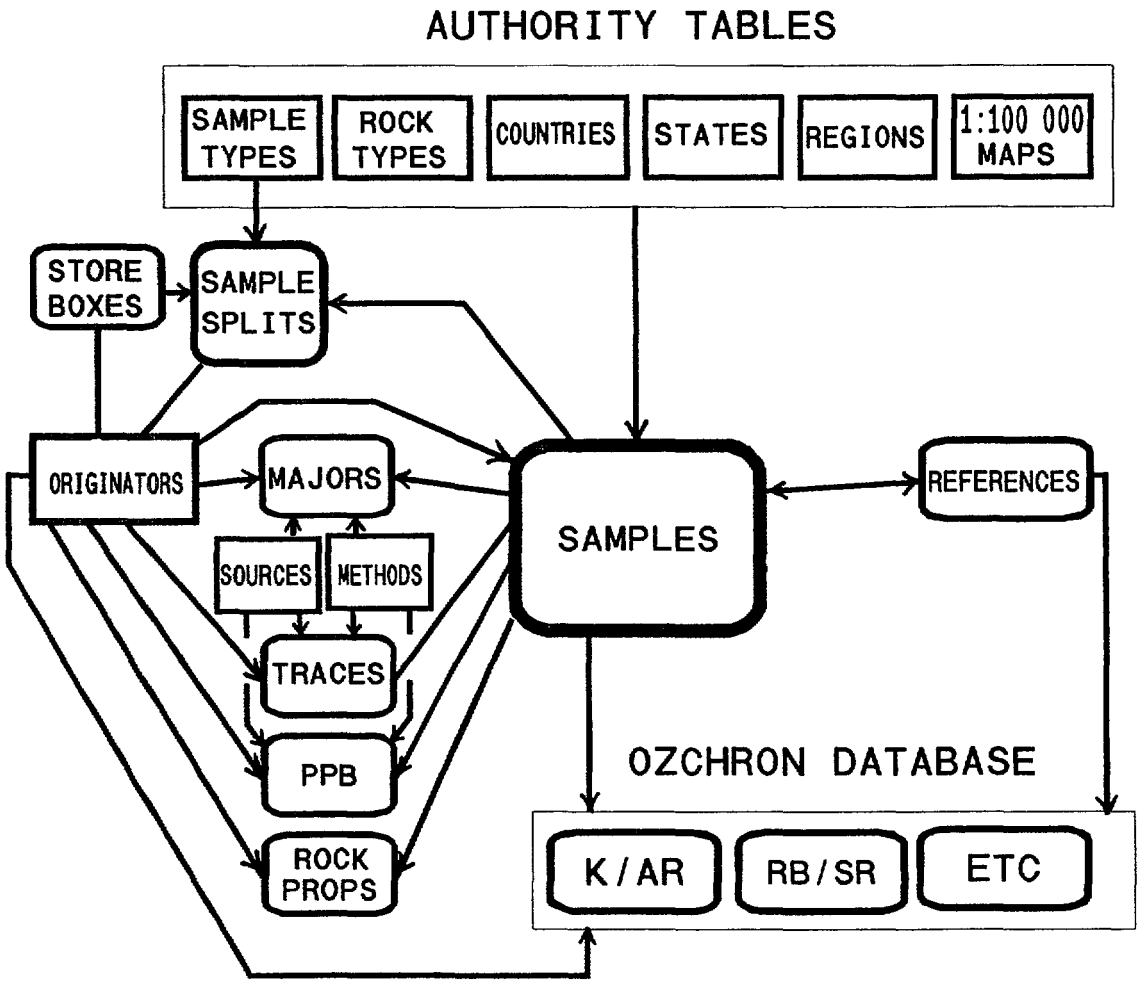
third-generation language (3GL) such as COBOL. Nevertheless, 3GL database sytems take a long time to develop and are difficult to maintain and modify.

A relational database management system is the logical choice for much of the scientific data BMR generates. Most BMR databases are not sufficiently transaction intensive to warrant the time and effort required to program them in a 3GL, and great flexibility and productivity is gained by using a relational database manager. Most geographic information systems (GIS) are now built around a commercial relational database manager. Nevertheless, it is possible to build a database in which the data is divided amongst too many tables. Too much complexity can be a problem, so a balance must be sought. PetChem is essentially a compromise between a normalised relational database and a simpler "denormalised" scheme, more easily understood by the average user.

3 - STRUCTURE OF PETCHEM

PetChem currently consists of 6 main tables, surrounded by a number of 'authority' tables. The full definitions of all tables are listed in appendix A.

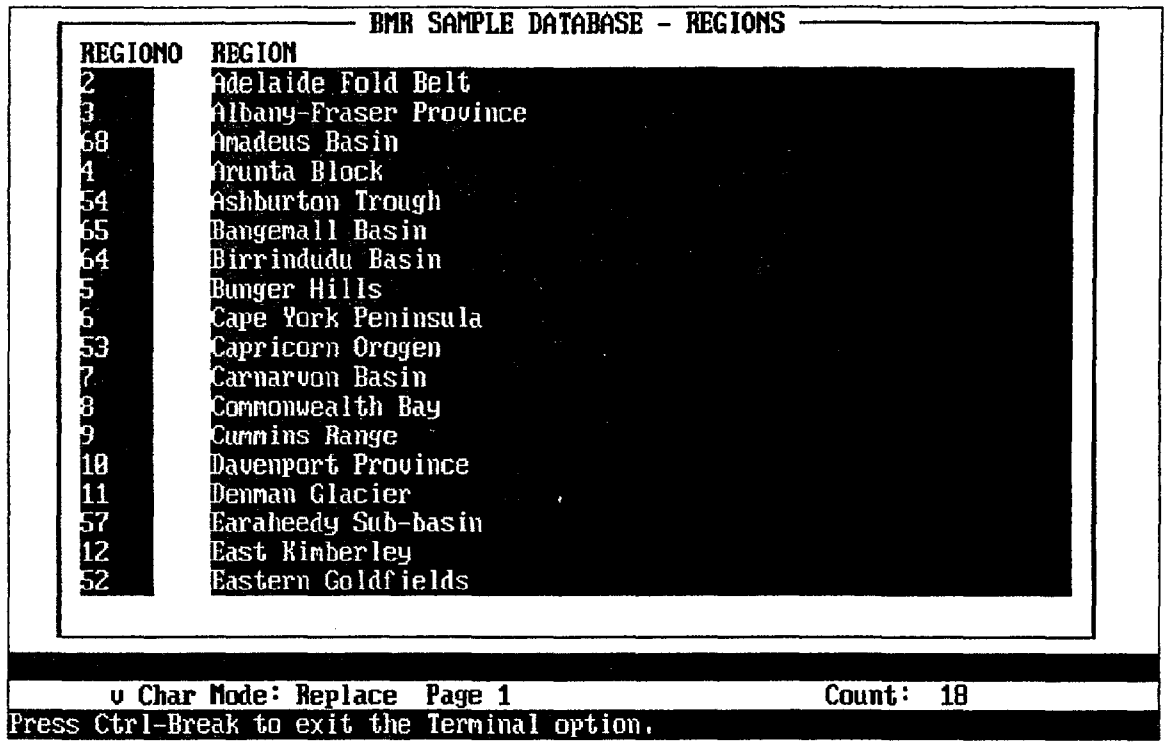
Table Name	Contents
SAMPLES	Samples and their locations
SAMPLESPLITS	Sample splits and their storage
MAJORS	Major element rock analyses
TRACES	Trace element rock analyses in p.p.m.
PPB	Analyses expressed in parts-per-billion
ROCKPROPS	Density and magnetic rock propeties
REFERENCES	Bibliographic references
ORIGINATORS	List of valid contributers
COUNTRIES	List of valid countries
STATES	List of valid Australian States
REGIONS	List of valid regions
HMAPS	List of valid 1:100,000 maps
SAMPLETYPES	List of valid sample types
ROCKTYPES	List of valid rock types
STOREBOXES	List of valid boxes in rock store
SOURCES	List of valid sources of analyses
METHODS	List of valid analytical methods
MAXNOS	Table for highest index number



A schematic diagram of the PetChem database showing the main relationships between the PetChem tables. Also shown are some of the links with the OzChron database for geochronology results. Nearly all relationships are many to one, the arrow heads indicating the 'many' side of a relationship. The one exception is the link between SAMPLES and REFERENCES, where one reference may have many samples, but one sample can have up to 5 references.

4 - AUTHORITY TABLES

The authority tables in section 3 are most of those labelled 'List of valid ...'. These tables generally consist of a number and a text field. For example, the REGIONS table consists of a region number and a region name - e.g. -



The region names in this table are unique. Each region appears once, and only once, in this table, and nowhere else in the database. The SAMPLES table refers ('relates') to the region name via its associated number.

These tables play an important role in limiting the possible entries in some fields in the samples and analyses tables. The ORIGINATORS table, for example, contains the list of all possible originators, that may, nevertheless, be added to as the need arises. When entering an originator number in the SAMPLES, MAJORS, TRACES, or PPB tables, only the numbers that are already in the ORIGINATORS table may be entered. Thus, it is not possible for 'Brown, B.B.' to be mistakenly entered as 'Brown B.B.' (without the comma after 'Brown') and for later retrievals of Brown's data to omit that record because of a missing comma.

The MAXNOS table cannnot be accessed by database users. It is used by triggers in various forms to keep track of the current highest number in monotonically increasing number fields. Analysis number is a good example.

5 - ACCESS TO TABLES

To be able to access the tables in the database you should be a registered Oracle user with a name and password (not to be confused with your username and password for the operating system on the Data General computer). However, anyone with access to the DG computer may log into Oracle as FIELDLAB/FIELDLAB and obtain select-only privileges from PetChem's tables. Only analytical data more than one year old may be viewed.

Most PetChem users have a view of the database which allows them select, insert, update and delete privileges on samples and analyses for which they are the originator. They are not able to add to, update, or delete other originators' data. Some users have a broader view - Gladys Warren, for example, has a view that encompasses all of the Arunta Block data. Your view can be enlarged if necessary if you feel it is too restricted. Most users are not able to add to or alter data in the authority tables - they can only view the data. If you wish to add rows to any of these tables, see the data manager for PetChem.

If you use SQL*Plus to access tables, most table names must be prefixed by 'GEOCHEM.' - the name of the owner of the tables. Thus the ORIGINATORS table must be refered to as 'GEOCHEM.ORIGINATORS'. Exceptions include the SAMPLES, MAJORS, TRACES, and HMAPS tables. For the first three, views have been created for each user and synonyms defined in such a way that the original table name may be used. HMAPS is a public synonym, and may be referred to without prepending the name of the owner.

6 - SAMPLE NUMBERING

With the help of an 'originator', PetChem uses original sample numbers as part of a primary key for the SAMPLES table. If all samples were from BMR, and had unique BMR registered numbers, a sample number would be sufficient in itself. However, the SAMPLES table is also intended for data provided by universities, State geological surveys, private individuals, etc., all of whom use their own numbering systems. An originator is thus required to maintain the uniqueness of a sample amongst diverse sample numbers.

A sample in PetChem is fully identified only by a combination of ***Originator Number*** and ***Sample Number***, the sample number being any sequence of numbers and letters up to 16 characters long. This uniqueness is protected by a concatenated index covering both fields - it not possible to enter a combination already in the SAMPLES table. All analytical tables, such as TRACES, record both originator number and sample number. In practice, though, a sample number on its own is usually sufficient to retrieve the required sample.

The originator of a sample is the person or organization primarily responsible for the data. It could be the person who collected the sample, the laboratory worker, or an author of published results - someone who might reasonably be expected to know about the sample and be able to supply further information. Note that the name of the Originator is recorded only once in the database. All other references to the Originator use the Originator Number, which is listed against the name in the ORIGINATORS table.

7 - LOGGING ON AND OFF THE LAN AND THE DG MV 20 000 COMPUTER

LAN stands for local area network, and the LAN must be used to talk to the DG computer. At present, nearly all terminals and PCs used as terminals are connected to the Sytek 2000 LAN. You must log onto the LAN before you log on to BMR's DG MV20 000 computer.

7.1 PC users should run a DG terminal emulation program to access the Data General computer. In general, only those programs that specifically mimic a DG 200 or 400 series terminal can be used with Oracle Forms (although it is also possible to use other emulations such as DEC VT100). Most PCs used to access the DG computer have a program called DASHER, or LOGON, on a CEO directory. If your PC has a starting menu, press the number in the menu to run the "DATA GENERAL TERMINAL".

7.2 Press ***<CR>*** or ***<RETURN>*** to obtain the the LAN's "#" prompt. On PCs you must use ***<CTRL-M>***, as there is no return key.

7.3 Log on to the LAN with ***dg <CR>*** , or ***dg <CTRL-M>***.

7.4 Press ***<ENTER>*** to obtain the DG's log-on invitation.

7.5 Type your DG user name followed by ***<ENTER>*** -- for example ***DOONE.PET <ENTER>***.

7.6 Type **your DG password *<ENTER>*.** Provided your user name and password were correctly entered, your DG operating system prompt will now be displayed - e.g. "DOONE.PET>"

7.7 To log off from the DG type ***BYE <ENTER>***.

7.8 To log off the LAN type ***<CONTROL-G> <BACKSPACE>***, followed by ***DONE <CR>***, or ***DONE <CONTROL-M>***.

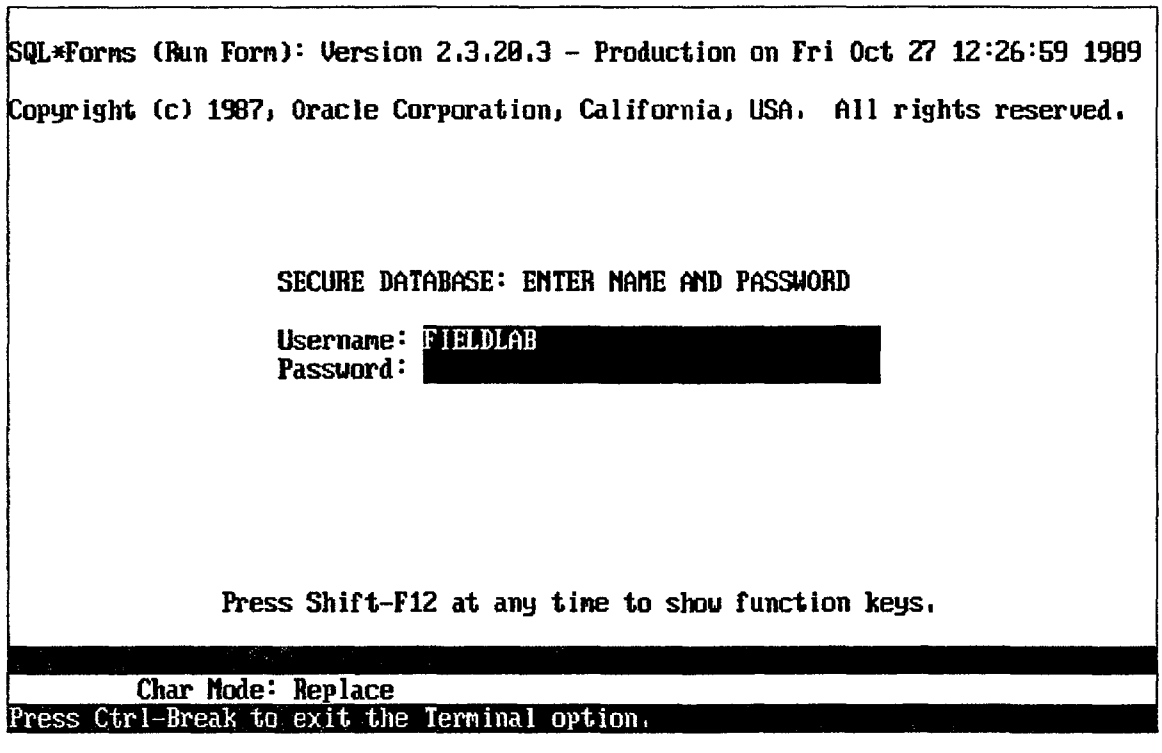
7.9 On PCs press ***<CONTROL-BREAK>*** to exit the terminal emulator program.

8 - RUNNING THE PETCHEM FORMS MENU

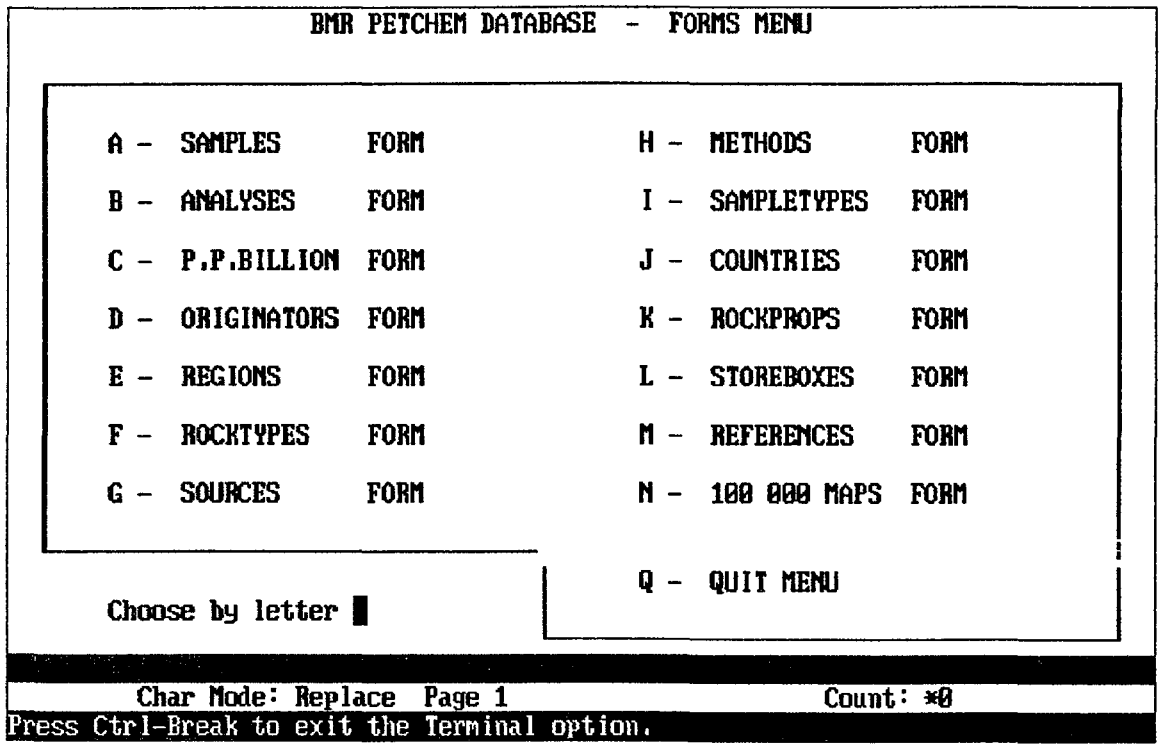
Access to the PetChem database centres around a menu used to branch to the screen forms associated with various tables in the database. Most ad-hoc queries, inserts and updates are performed via these forms, although you should also know that batch retrievals and updates are often done interactively using the SQL language. The steps required to run the PetChem forms menu are -

8.1 Following a successful log-on, type ***GEOCHEM <ENTER>*** to gain access to the directory :UDD:ROD.DBASE:GEOCHEM, or ***SEA [!SEA] :UDD:ROD.DBASE:GEOCHEM <ENTER>***. Both methods append the directory to your current search list, and give you read and execute access to all files, including forms, .SQL and .CLI files.

8.2 Type ***PETCHEM <ENTER>*** to run the PetChem forms menu, or ***MACFORM <ENTER>*** on a DG 200 series terminal, Wyse terminal, or Apple MacIntosh with DG 200 terminal emulator.



Supply your Oracle user name and password as requested. Following a successful logon, the PetChem menu form is displayed as follows -



The various selections on the menu form are all PetChem forms you can run by entering the appropriate letter.

8.3 To observe the keys and functions available in the forms, press ***<ESCAPE> K***. Press ***<ALT F1>*** to exit back to the form. Function key overlays for PC/XTs, PC/ATs, and Data General terminals are included at the end of these notes.

8.4 Should you encounter an **Oracle error** while using any of the forms covered by the menu, including the menu itself, the fact will be reported in the status line at the bottom of the screen. Use key ***<F12>*** to try to find out what the error is. In many cases you will find the explanation uninformative, but 'duplicate value in index' means that an attempt has been made to enter a record with the same primary key - e.g., Originator and Sample Number. This error will occur if you attempt to commit any duplicate value in a field or fields covered by a unique index. Use key ***<F11>*** to return to the form after inspecting the error message. Do not hesitate to contact Rod Ryburn or the Database Administrator if you run into an intractable error.

8.5 When you use a PC to access Oracle Forms you will have to contend with a keyboard that differs somewhat from DG terminals. If using one of the CEO teminal emulators ("DASHER", "LOGON", etc) the main differences are as follows -

Data General Terminal	**IBM PC/XT or Clone**
Function keys 1-10	**1-1 correspondence**
Function keys 11-15	**ALT-F1 = F11 etc.**
NEWLINE	**ENTER**
RETURN	**CONTROL-M**
HOME	**CONTROL-H**
C1	**Home**
C2	**Pg Up**
C3	**End**
C4	**Pg Dn**

Most PC-ATs also have function keys F11 and F12 - which may or may not function as they do on a DG terminal, depending on the hardware and the terminal emulation software being used.

8.6 You may exit any form by pressing ***<F11>***, or ***<ALT F1>*** on PC/XTs. The menu form may also be exited (quit) by typing ***Q <ENTER>***.

9 - QUERYING THE DATABASE FROM A FORM

Querying the database means selecting or retrieving data from the database. In an Oracle form, data from a database may be displayed one or more records at a time by "entering" and "executing" a query. Various conditions may be included to limit the records retrieved and place them in a specified order.

9.1 With the required form on the screen, to initiate a query of the underlying table press function key ***<F2>*** - "enter query"

9.2 Move the cursor forward one field at a time with ***<NEWLINE>*** or ***<ENTER>*** , and backwards with ***<HOME>*** or ***<CONTROL H>***. Note that you **must** use ***<CONTROL H>*** on a PC, as its HOME key does not work in the manner of a DG terminal.

9.3 Enter the appropriate query data into the relevant field(s). For example, enter the required sample number into the Sample Number field. Note that sample number alone is not necessarily unique - several records may occur with the same sample number, but different originators. In this case, if you wish to be precise, enter the Originator Number as well.

9.4 Alternatively, a *%* symbol may be used in conjunction with the text - meaning 'and whatever comes before', or 'whatever comes after'. For example, if you enter ***Coopers%*** you will get "Coopers Creek" and "Coopers Crossing" - ***%Smith%*** will get you "John Smith", as well as "Charlie Smithers and Son". A consequence of this convention is that if a *%* symbol happens to occur in a character value you wish to retrieve, double up the *%* in the entered query value. In other words, enter ***100%%*** to find "100%". A disadvantage with using *%* in front of the entered value is that it negates the advantage of any index on the field, and can thus slow a query drastically.

9.5 Now "execute" the query by pressing function key ***<F1>***. After a variable but usually slight delay, during which the word "working" is displayed in the status line at the bottom of the form, the data for the sample appears in the form. If a query is executed on an empty screen, all records from your view the database will be retrieved.

9.6 A query by sample number will normally retrieve one record only. A query by Stratigraphic Unit, however, will often retrieve the data for many samples. In order to observe them on the form, use the **<down arrow>** key to step through the data, record by record - the **<up arrow>** to go backwards. In foms that display many records at once - the Originators Form, for example - you may step forwards to the **next set of records** (i.e., the next screen-full) with ***<C4>*** or ***<Pg Dn>*** on a PC. Unfortunately, no key exists for 'previous set of records'.

9.7 It is also possible to enter < and > symbols before a number entered as a query. Note, however, that this will not work in the sample number field, which is a character field.

9.8 More complex queries can be done by entering ***&X*** (or ***&A***, etc.) into a field. When ***<F1>*** is pressed to execute the query, the form displays a field at the bottom of the screen that allows you to enter a SQL 'where-clause' in which the field is referred to by the ***&X*** (or whatever). For example, if ***&X*** is entered in the sample number field of the major-element analyses form, the following where-clause will extract all records for the Marraba 1:100 000 sheet in the Mount Isa Region -

```
&X IN (SELECT SAMPNO FROM SAMPLES
        WHERE MAPNO = 6956)      - Marraba Sheet
```

This facility can also be used to find records with fields where ***&X IS NOT NULL*** or ***&X IS NULL*** - i.e., where there is, or is not, any data.

9.9 Some forms have two or more 'blocks', corresponding to two or more underlying tables. The Samples and Analyses Forms are examples of tables with two blocks. Use key ***<C2>*** to move the cursor to the next block - ***<C1>*** to move back again. The equivalent keys on a PC are ***<Pg Up>*** and ***<Home>***. Each block functions as a separate form. Although the primary key (e.g., originator + sample number) is copied automatically to the second block when the cursor is moved to it, the second block may be enterered, updated and queried independently.

9.10 There are a few pitfalls to watch for when querying a form. If a name like "O'Shannassay" must be entered into a form field, the apostrophe must be doubled up like this - ***O''Shannassay*** (these are two single quotes, not one double quote). Beware of using the wrong case - "basalt" will not get "BASALT". However, it is possible to use the SQL UPPER or LOWER functions if the '**&X**' method is employed - e.g., ***WHERE LOWER(&X) = 'basalt'***.

10 - UPDATING THE DATABASE FROM A FORM

Forms may be used to update individual records in a table. Where updates are required that apply equally to many records, then it is usually quicker and easier to use SQL*Plus to bulk-update tables in the database (see section 19).

10.1 To update the data retrieved in a form as the result of a query, just change the data that appears on the form. If many records have been retrieved (say, by originator number) you may step through them with the up and down arrow keys, making corrections and additions at will.

10.2 Understand that no changes occur in the database itself until the changes have been committed. This may be done manually with the ***<F3>*** commit key, or automatically on exit from the form. In the latter case you will be asked if you want to commit the changes you have just made. Answer yes if you are sure.

10.3 The corollary of this is that you should answer no if you are unsure as to what changes are meant. Better to have to re-enter data, rather than inadvertently corrupt the database.

10.4 Commiting changes to the database is exactly like having a document during an editing session with a word processor. The changes are made on disk only when they are committed.

10.5 Occasionally, if someone is in the process of updating a table via SQL*Plus, you may experience a delay in committing updates or inserts. Just be patient. One way to test the water, so to speak, is to overtype a letter in a field with the same letter and commit the 'change' (Oracle regards this as an update!). If all is clear, the update should commit quickly.

11 - ENTERING NEW DATA FROM A FORM

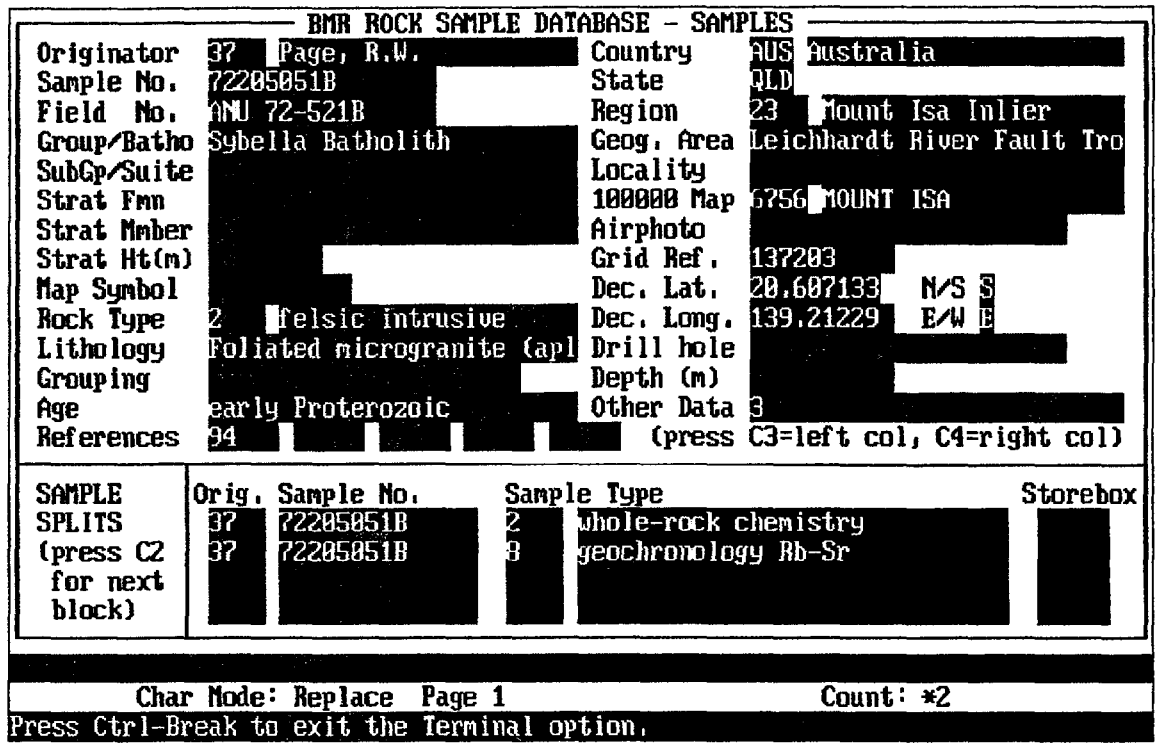
11.1 To enter new records into the database you **must** start with a blank form - either that which presents itself on first entering the form, or that produced by pressing the create record key ***<F4>***. **If not, you are merely updating an existing record, not inserting a new one!**

11.2 In general, one should press the create record key (***<F4>***) before any new data are entered, even if it is not, in fact, needed.

11.3 One can, however, retrieve data that was on the screen prior to using the create-record key. For this, press ***<SHIFT F4>*** 'duplicate record' - and enter, modify or delete fields as required. It is often useful to retrieve a previously entered record to save having to retype all fields.

11.4 Like updated data, new records must be committed to the database with function key ***<F3>***, or when prompted on exit from the form.

12 - THE SAMPLES FORM



This form is for data on samples, their provenance and storage. The form covers two tables, the SAMPLES and SAMPSPLITS tables, that are central not just to PetChem, but to other databases that have field samples. The SAMPSPLITS table indicates the sample type and its box number in the rock store. Note that the one sample number can have many sample splits, and that several sample splits with the same sample type can exist if the sample is distributed between more than one box.

The Samples Block has 7 **relational fields** - Originator, Sample Type, Rock Type, Country, Region, 1:100 000 map, and References. In each case there is an associated table containing the value pointed to by a number (a 3-letter mnemonic for Countries). The number field is what is stored in the SAMPLES table. In insert and update modes, the name associated with the numbers appear automatically as soon as the number is entered. In most cases you can enter '1', which corresponds to 'unknown'. You may also enter a name in the second field - the number will appear automatically. In either case, if the value entered does not exist in the appropriate authority table, a message to that effect will appear in the status line at the bottom of the form.

In query mode, the name associated with the number does not appear automatically. To find the number associated with a particular name you can go into the appropriate form from the forms menu. Alternatively, use insert or update modes to enter a name and read the resulting number. Don't forget to cancel the resulting commit. Refer also to the appendix in the back of these notes, which will, however, go out of date quite rapidly.

Originator - Mandatory relational field of 5 digits. The originator is generally the person or organization that collects the sample and/or submits it for laboratory work. The main purpose of this field is to ensure a unique combination of originator and sample number. However, it also provides a valuable selection criterion, and an indication of where to go for more information on a sample.

Sample Number - Mandatory field of 16 characters. Any combination of letters and numbers may be entered, as long as it is unique to the originator. However, all BMR samples should have registered BMR numbers. Attempts to enter non-unique combinations of originator and sample number will fail when commiting the transaction, with an error message indicating 'duplicate value in index'.

Field Number - Optional field of 16 characters. Designed to accommodate any alternative numbering systems that might apply to a sample or group of samples. For example, some samples are given field numbers, or other IDs, that differ from the final registered numbers.

Group or Batholith - Optional field of 64 characters. Stratigraphic group or igneous batholith to which the sample belongs.

Subgroup or Suite - Optional field of 64 characters. The name of any stratigraphic subgroup or igneous suite pertaining to the sample.

Stratigraphic Formation - Optional field of 64 characters. The relevant stratigraphic unit name at the formation level.

Stratigraphic Member - Optional field of 64 characters. The name of a stratigraphic member, if appropriate.

Stratigraphic Height - Optional number field with up to two decimal places. Designed for samples from a measured section or drill hole. This value could conceivably be used in the future for one ordinate on computer generated graphs and diagrams.

Map Symbol - Optional field of 10 characters. The letter symbol used on 1:100 000 or 1:250 000 geological maps for the rock unit from which the sample was collected.

Rock Type - Mandatory relational field of 5 digits. See appendix A for the list of 17 permissible rock types, 1 being 'unknown'. This list can be expanded if necessary.

Lithology - Optional field of 64 characters. Field for a full description of the lithology of the sample in the originator's own words.

Grouping - Optional field of 22 characters. This field allows the user to supply any other divisions for a suite of samples that he or she sees fit - for example, the alteration zones of an ore body.

Age - Optional field of 64 characters. The geological age as accurately as known - e.g., late Ordovician. Please supply absolute age if known - e.g., early Proterozoic (1860Ma). Comments may follow.

Country - Mandatory relational field of 3 capital letters. The supplied default value is 'AUS'.

State - Field of 3 capital letters, mandatory if country is Australia. Only the standard capital letter abbreviations for Australian states can be entered. Overseas samples cannot have a state, even in the USA.

Region - Mandatory relational field of 5 digits. Only those regions in the REGIONS table may be entered. A region is a recognised geological province or area such as the Lachlan Fold Belt, Mount Isa Inlier, or Carnarvon Basin. Understand that it is possible for regions to overlap, and the region that is given may depend on the purpose for which the sample was collected.

Geographic Area - Optional 64 character field. The name of the geographic area (e.g., valley, plain, mountain range) from which the sample comes. Examples are 'Newcastle Range' and 'Tuggeranong Valley'.

Locality - Optional 64 character field. A description of the sample site to aid in its relocation in the field. For example, '5.5km NW of Brown's Bore, on east bank of dry creek'.

1:100 000 Map - Relational field of 4 digits - mandatory if country is Australia. The number supplied must identify one of the standard-series 1:100 000 map in the HMAPS table. In insert or update mode, the name may be entered and the number retrieved automatically. Only the map number is stored in the SAMPLES table.

Grid Reference - Field of 6 digits - mandatory if 1:100,000 map name is given. The 6-digit reference required is the type described on the face of Australian 1:100 000 maps. The grid reference given must be metric and on the Australian National Spheroid.

Decimal Latitude - Field of 8 digits - mandatory if sample is not from Australia. Up to 6 digits may follow the decimal point. For Australian samples this field may be entered, or it may be filled in later by running program GetLat, which calculates latitudes and longitudes from the 1:100 000 maps and metric grid references and inserts them back in the SAMPLES table.

North or South - Single character field, 'S' by default. Only 'N' or 'S' may be entered. Make sure this field is correctly filled in for samples from outside Australia. Some samples from Indonesia, for example, are from north of the equator.

Decimal Longitude - Field of 9 digits, 7 of which may follow the decimal point. Otherwise as for latitude.

East or West - Single character field 'E' by default. Only 'E' or 'W' may be entered. Make sure this field is correctly filled in for samples from outside Australia (e.g. Antarctica). It must be given as 'W' for latitudes measured west of the Greenwich Meridian.

Drill Hole - Optional field of 22 characters. If the sample is from a drill hole, its name, or some other identification, is required.

Depth in Metres - Optional field of 10 characters. The depth of the sample from within the drill hole. A character field is used here to enable depth ranges to be entered - e.g. '112-115' - as some samples are collected from a depth interval rather than one specific depth.

References - 5 optional numeric fields of 5 digits each. Up to five numbers for bibliographic references may be entered. These **must** be existing reference numbers in the REFERENCES table. The form will not allow you to enter a reference number that does not already exist. The five fields are a compromise that obviates the requirement for a separate samples-versus-references table that a fully relational solution would require.

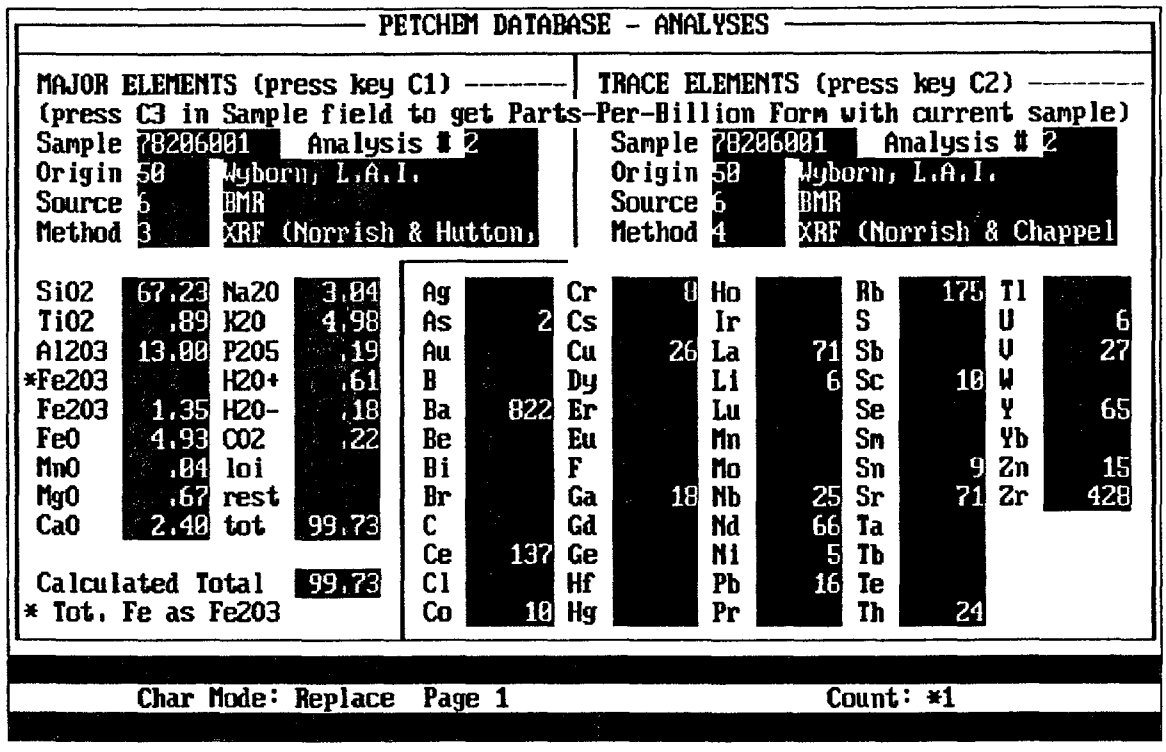
Other Data - Optional field of 64 characters. May be used for any data not covered by the above fields that the user feels are relevant.

Entry Date - Invisible date field. This field automatically assumes the date that the sample data is inserted into the SAMPLES table via the form.

Sample Type - Mandatory relational field of 5 digits. The sample type entered must be one of those in the SAMPLETYPES table - e.g. 'whole-rock analysis' or 'geochronology'.

Storebox - Optional numeric field of up to 5 digits. This number must correspond to a Storebox Number already in the STOREBOXES table. Although most existing samples do not yet have a Storebox Number, it may become a requirement for all new BMR samples housed in BMR's rock store.

13 - THE ANALYSES FORM



The Analyses Form has two blocks covering MAJORS and TRACES, the tables for major and trace element analyses. When moving from Majors to Traces with key ***<C2>*** (***<Pg Dn>*** on a PC), the originator and sample number in Majors are automatically copied to the Traces. All that is then necessary to retrieve the corresponding trace-element analysis (or possibly analyses) is to press key ***<F1>*** "execute query". Major and trace element analyses may also be entered, updated, queried, and deleted independently of each other. The 'Analysis Numbers' in each table are monotonically increasing numbers assigned by the system. They function as primary keys, allowing more than one analysis per sample number. Analyses may occasionally be obtained by more than one method, or from different laboratories. Note that the analysis numbers do not correspond between the two tables.

The Traces Block does **not** include all trace element fields in the TRACES table. As you can see from Appendix A, there are many more elements in the table than those shown on the form. Additional elements can be included in the form if needed, or alternative forms constructed.

Analysis Number - Mandatory field of up to 5 digits. Primary key field assigned by the system - cannot be inserted or updated. May be used to query the tables.

Source Number - Mandatory relational field of up to 5 digits. The 'source' of an analysis is normally the laboratory that performed the analysis or the person or organization that provided the data (e.g., BMR, BMR restricted, BHP, B.W. Chappell). The SOURCES table contains the authority list of all sources to date. This field is important, as it provides a means of limiting access to the data. We may not wish to sell data back to the person or organization that originally donated it!

Method Number - Mandatory relational field of up to 5 digits. The method by which the laboratory analysis was performed. The details of analytical techniques used are in the METHODS table, which is accessible from PetChem's Forms Menu.

Major Elements - Optional numeric fields of up to 4 digits, two after the decimal point. Automatically right justifed. **Detection limit values are entered as negative numbers** - you cannot enter '<0.02' or 'n.d.'.

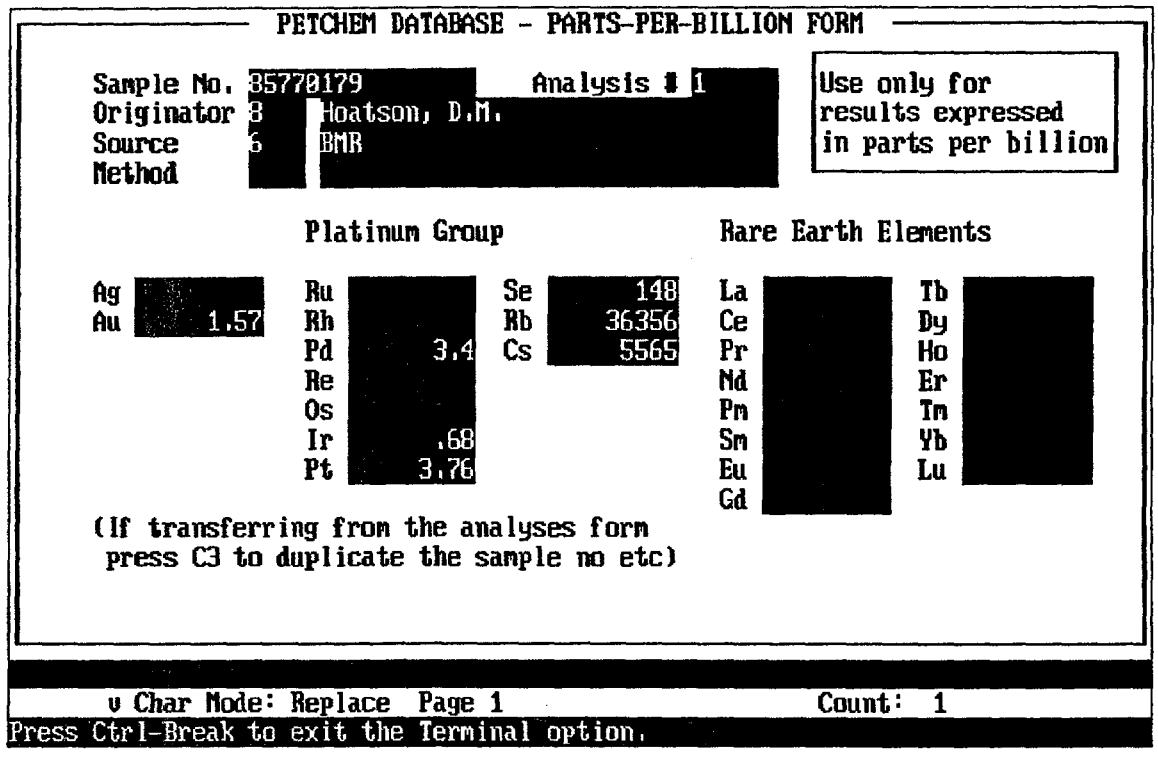
***Fe2O3** - This field is reserved for total iron as Fe_2O_3. It should be entered only for analyses in which the oxidation state of iron has not been determined. If total iron is quoted as FeO, multiply it by a factor of 1.1 before entering the result. Entries in this field are added to the calculated total. Where the field is entered, the fields for FeO and Fe2O3 should be left empty.

Total - Optional numeric field of up to 5 digits. This is for an entered total.

Calculated Total - The value in this field is automatically calculated from the data in the major-element fields. It cannot be entered and is not a database field. Except where detection limit values are involved, this field provides a check on the entered total - the two should coincide. Because detection limit values are entered as negative numbers, they are **subtracted** from the calculated total.

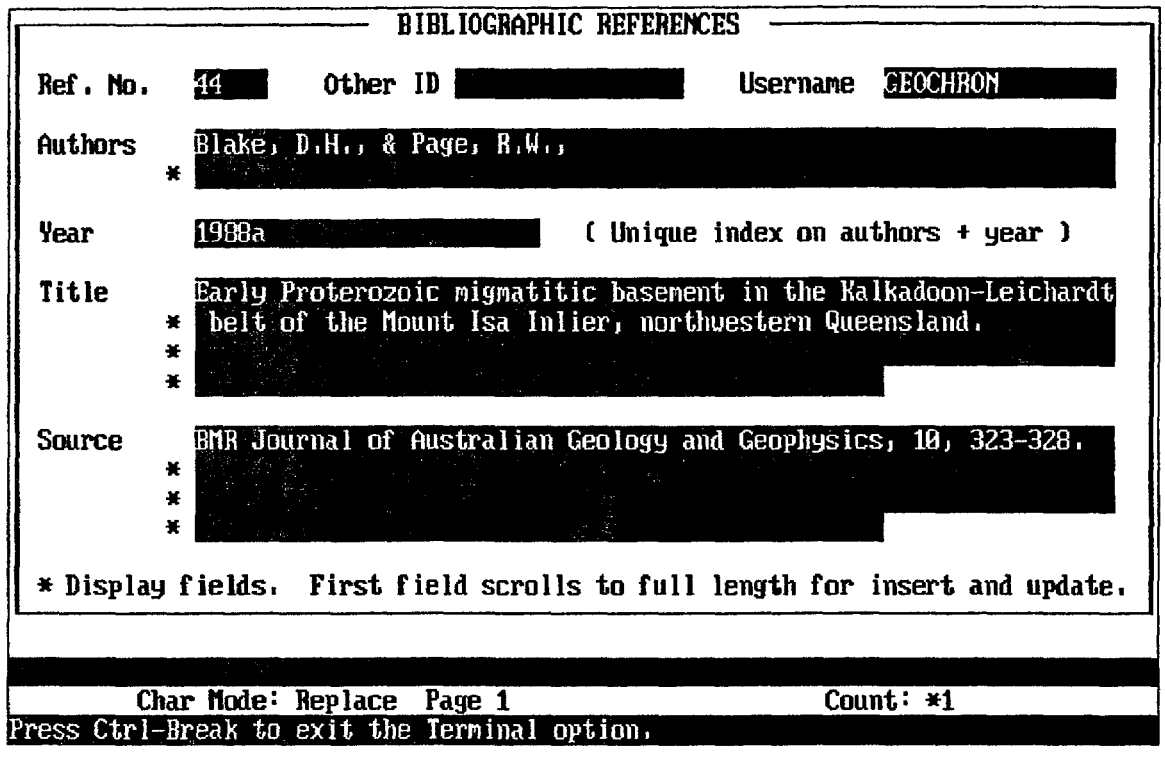
Trace Elements - Optional numeric fields of up to 8 digits, two of which may be after a decimal point. Automatically right justified. As is the case for major elements, a negative entry signifies a detection-limit value.

14 - THE PARTS-PER-BILLION FORM



This form is designed exclusively for analytical results expressed in parts per billion - trace elements determined by neutron-activation analysis, for example. The Originator, Sample number, Source and Method fields are the same as those described under the Analyses Form. The fields for analytical results hold up to 8 digits, 3 of which may fall after the decimal point. As before, detection limit values are entered as negative values.

15 - THE REFERENCES FORM



The Bibliographic References Form acesses the REFERENCES table, which is shared with other databases. Although this table may eventually be replaced by a multi-table bibliographic database, a single table provides a reasonable interim solution, and is a lot simpler than a full relational system. As all references are equally accessible to all users, do not delete or update other people's references unless they are clearly in error. Your Oracle user name is automatically stored with each reference inserted, providing a means of identifying 'your' references, as opposed to those entered by other users such as 'GEOCHRON'.

The authors and year fields are spanned by a concatenated unique index. This means that no two references can have the same values in the author(s) and year fields. If you try to commit such a reference you will be greeted by the Oracle error - 'duplicate value in index'. To allow references sharing the same author list and year to exist in the database, add 'a', 'b', 'c', etc. to the year, as may be needed. For example, the references 'Smith, T.J., 1989a -' and 'Smith, T.J., 1989b -' can coexist in the REFERENCES table.

Reference Number - Mandatory field of up to 5 digits. A monotonically increasing primary key field assigned by the system. Cannot be inserted or updated by the user, only queried. The Reference Number fields in the Samples Form refer to this field.

Other ID - Optional field of 16 characters. Any other identifying sequence the user may care to supply.

Username - Mandatory field of up to 16 characters. Cannot be inserted or updated, only queried. The system automatically inserts your Oracle username when adding a new reference. Thus the identity of the person who inserted a reference is always known.

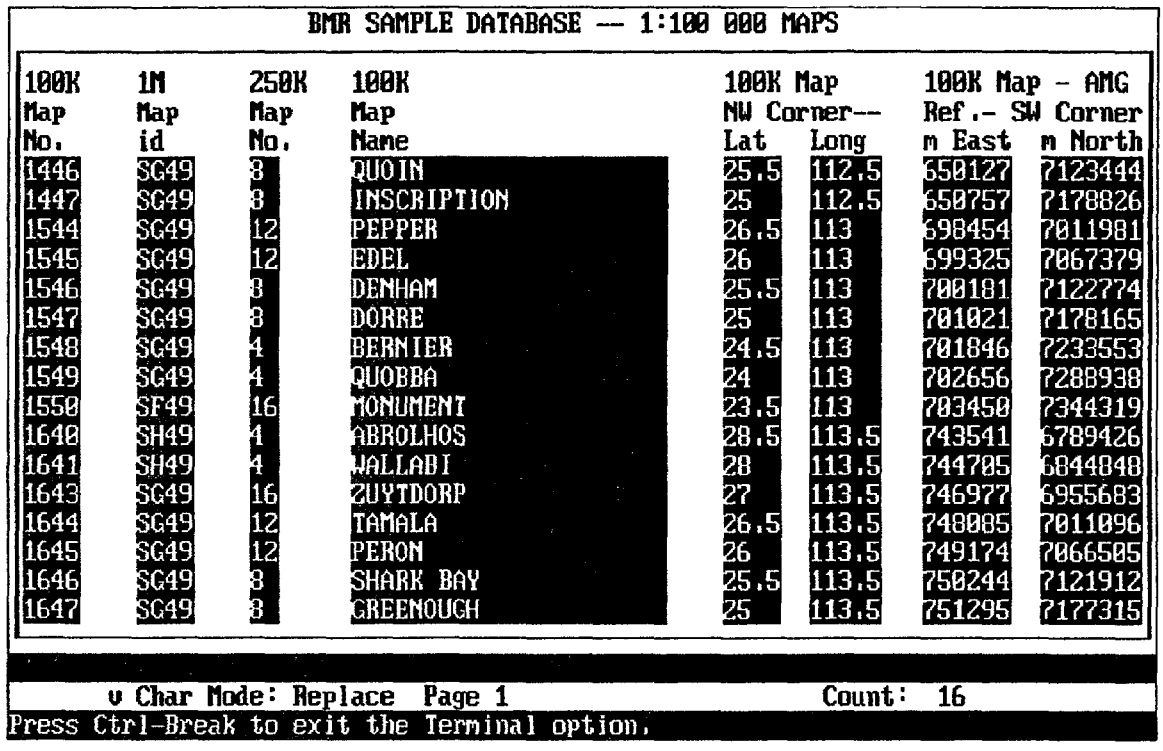
Authors - Mandatory field of up to 128 characters. Use the standard BMR ordering and punctuation style, with initials following surname and full stops after initials, but no spaces between initials. See existing references in the table if you are unsure as to the style.

Year - Mandatory field of up to 16 characters. As well as a year, with or without a letter suffix, you may enter 'in press', 'in prep.', and 'pers. comm.'

Title - Optional field of up to 240 characters. Titles longer than this should be truncated and terminated with '...'. Include a full stop at the end of all titles. Additional collective titles - e.g. symposium titles - should be put at the beginning of the source field.

Source - Optional field of up to 240 characters. The journal name, volume, and page numbers - or alternatively the publisher, publisher's city, and number of pages. Use the standard BMR style.

16 - THE 1:100 000 MAPS FORM



BMR SAMPLE DATABASE — 1:100 000 MAPS

100K Map No.	1M Map id	250K Map No.	100K Map Name	100K Map NW Corner-- Lat	Long	100K Map - AMG Ref.- SW Corner m East	m North
1446	SG49	8	QUOIN	25.5	112.5	650127	7123444
1447	SG49	8	INSCRIPTION	25	112.5	650757	7178826
1544	SG49	12	PEPPER	26.5	113	698454	7011981
1545	SG49	12	EDEL	26	113	699325	7067379
1546	SG49	8	DENHAM	25.5	113	700181	7122774
1547	SG49	8	DORRE	25	113	701021	7178165
1548	SG49	4	BERNIER	24.5	113	701846	7233553
1549	SG49	4	QUOBBA	24	113	702656	7288938
1550	SF49	16	MONUMENT	23.5	113	703450	7344319
1640	SH49	4	ABROLHOS	28.5	113.5	743541	6789426
1641	SH49	4	WALLABI	28	113.5	744705	6844048
1643	SG49	16	ZUYTDORP	27	113.5	746977	6955683
1644	SG49	12	TAMALA	26.5	113.5	748085	7011096
1645	SG49	12	PERON	26	113.5	749174	7066505
1646	SG49	8	SHARK BAY	25.5	113.5	750244	7121912
1647	SG49	8	GREENOUGH	25	113.5	751295	7177315

v Char Mode: Replace Page 1 Count: 16

Press Ctrl-Break to exit the Terminal option.

The 1:100 000 Maps Form is an example of a form covering an authority table. The underlying HMAPS table is an important table in its own right, with public select access to anyone logged into Oracle on the DG system. The form allows select privileges only. Since other authority forms, such as the Originators and Regions Forms, are similar or simpler, only one authority form is described.

100K Map Number - The four digit number that identifies the 1:100 000 map sheet from about 3000 covering Australia.

1M Map ID - The 1:1 000 000 map sheet in which the 1:100 000 sheet lies. This ID consists of two capital letters followed by two numbers - e.g., 'SF54'. The two digits are the UTM zone, which is needed to convert metric references to latitude and longitude.

250K Map Number - Up to 2 digits identifying the 1:250 000 map sheet from 16 covering each 1:1 000 000 map area. The full 1:250 000 map ID is obtained by joining the 1:1 000 000 map ID to this number - e.g., SF54-12, which is the Winton 1:250 000 map sheet, in Queensland. Note that the 1:250 000 map sheets in Tasmania are the theoretical ones, not the shifted ones actually published.

100K Map Name - Up to 22 upper case characters for the name of the 1:100 000 map sheet identified by the 100K Map Number. There are many offshore sheets which are named 'UNNAMED'.

100K Map NW Corner Lat. & Long. - The decimal latitude and longitude of the northwest corner of the 1:100 000 map sheet. It is possible, using a single SQL*Plus command, to make use of this field to select a 1:100 000 map name for any given latitude and longitude.

100K Map AMG Ref. SW Corner Easting and Northing - The metric easting and northing of the southwest corner of the 1:100 000 map sheet. These values are necessary to convert a 6-digit grid reference obtained from a 1:100 000 map to the full Australian Map Grid metres east and metres north.

17 - USING SQL TO QUERY THE DATABASE

If you wish to make full use of the power of Oracle, you must use SQL*Plus to make retrievals and updates. SQL*Plus is Oracle's version of SQL (Structured Query Language), a language that is now the industry standard for data manipulation and retrieval. Although screen forms allow you much freedom to select and update data in tables, you must use SQL*Plus for some of the more complex operations - for example, queries involing several tables. Unlike Fortran, Basic, Cobol, etc., SQL is a non-procedural language without loops, 'go-to' statements and subroutines. It is interpreted interactive language. Most users require only a small subset of the total SQL vocabulary.

17.1 From the DG operating-system prompt, type ***SQLPLUS <ENTER>*** to log into SQL*Plus. Supply your Oracle user name and password when asked. Once in SQL*Plus an 'SQL>' prompt is displayed.

17.2 To exit from SQL*Plus, just type ***BYE <ENTER>***.

17.3 To list a selection of major elements type -

```
SELECT SAMPNO, SIO2, MGO, K2O, NA2O FROM MAJORS
    WHERE ORIGNO  = 29                          - [Mackenzie, D.E.]
    AND SOURCENO  = 2;                          - [BMR]
```

- for example. Note that the semicolon is needed to terminate all SQL statements. The requested data will now be listed to the screen.

17.4 To print a listing like this, first type ***SPOOL TEMP <ENTER>*** before entering the select statement. When the listing has finished, type ***SPOOL OUT <ENTER>*** and the listing will be printed on the DG, ready for collection from PET's pigeonhole (for example). Note that file 'TEMP.LIS' remains in the current directory, and can be edited with SED, SLATE, or even CEO. With the help of CEO-CONNECT on your PC, it can also be transmitted to your PC (see section 18) for editing with WordStar, or whatever. Use ***SPOOL OFF <ENTER>*** to end spooling without printing (and retain the file TEMP.LIS).

17.5 A shorthand way to select all columns from a table is to use a * (star) in place of the column names. For example -

```
SET ARRAYSIZE 5;
SELECT * FROM TRACES WHERE ORIGNO = 15;  - [Greg Ewers]
```

Note that it is nececessary to set arraysize to 5 when selecting all columns from TRACES. Oracle's default buffer size is too small to handle the large number of columns in the TRACES table.

17.6 Because the PetChem Database is split into a number of tables, it is often necessary to combine the selection criteria from two or more tables. Here is an example of a select statement that retrieves some trace elements on the basis of the region number in the samples table. This is a very common requirement -

```
SELECT ORIGNO, SAMPNO, AG, AU, PT
    FROM TRACES, SAMPLES
        WHERE REGIONO = 31                  - [Pilbara Block]
        AND TRACES.ORIGNO = SAMPLES.ORIGNO
         AND TRACES SAMPNO = SAMPLES.ORIGNO
    ORDER BY SAMPNO;
```

Alternatively, a nested select using '**in**' may be used -

```
SELECT COUNT(*) FROM MAJORS
    WHERE SAMPNO IN (
        SELECT SAMPNO FROM SAMPLES
            WHERE MAPNO = 6856              - [Mary Kathleen 1:100 000]
              AND ORIGNO = 11);             - [Derrick, G.M.]
```

This last select statement returns the number of major-element analyses in the MAJORS table that G.M. Derrick has from the Mary Kathleen 1:100 000 map area.

17.7 Another common requirement is to select all **distinct** values from a particular field. For example -

```
SELECT DISTINCT STRATUNIT FROM SAMPLES
    WHERE REGIONO = 23                      - [Mount Isa Inlier]
    AND ORIGNO = 50;                        - [Wyborn. L.A.I.]
```

This particular selection will rapidly reveal all stratigraphic unit names, and especially any spelling anomalies.

18 - TRANSMITTING DATA TO A PC FILE

The most common need for this is to transmit files of geochemical data to PCs for plotting on the GDA sytem. There are two SQL command files for this purpose - SMALLCHEM.SQL and LARGECHEM.SQL - which all PetChem users have read and execute access. A listing of the SMALLCHEM.SQL is included in Appendix D at the back of these notes. It excludes many of the fields in the SAMPLES table that are not generally required for plotting purposes. Note that 'originator' and 'region' are reported by both number and name. LARGECHEM is essentially a flat-file view of all fields in the SAMPLES, MAJORS and TRACES tables. The steps required to retrieve a file of data are as follows -

18.1 Run a terminal emulator such as 'DASHER' to log on to the LAN. Terminate the emulator as soon as a LAN port has been obtained.

18.2 On your PC, log into the CEO directory, and run CEO-Connect by typing ***CEO <ENTER>***.

18.3 At the prompt 'HOST ID:', type ***DG <ENTER>***, or similar. This varies, depending on how the the program has been set up on your PC. Again, you may or may not be prompted for your username and password.

18.4 Select "Terminal Mode" from the menu. Type ***GEOCHEM <ENTER>*** to access the directory :UDD:ROD.DBASE:GEOCHEM. Log into SQL*Plus as described in section 17.1.

18.5 To run the SQL command file SMALLCHEM.SQL type -

```
@SMALLCHEM <ENTER>
```

Supply a region number when prompted. Note that the selected output will be placed in a file called TEMP1.LIS.

18.6 Of course, you may not want your data to be selected on the basis of a region number. If this is the case, before logging into SQL*Plus you must copy the file to your own directory -

```
COPY SMALLCHEM.SQL :UDD:ROD.DBASE:GEOCHEM:SMALLCHEM.SQL <ENTER>
```

You must then edit the file with the DG's SLATE or SED editors to impose your own selection criteria. Manuals on these editors are availible from Information Systems Branch. Once the file is to your satisfaction, run it as in 18.5 above. Be aware that you must have enough room in your current DG directory to accommodate the spooled output file. Unfortunately, SQL issues no error message whatsoever if the directory becomes full. If this is a problem, you may use a scratchpad directory on the DG to store the output -

SPOOL :ULD:SCRATCH:TEMP1.LIS;

This directory is cleaned out from time to time, so don't expect to keep files on it indefinitely.

18.5 Exit SQL by typing ***BYE <ENTER>***.

18.6 Exit Terminal Mode by pressing ***<CONTROL BREAK>***.

18.7 Select item 5 from CEO-Connect's main menu - "Retrieve file from host computer".

18.8 Enter ***TEMP1.LIS/T=TXT*** when asked for the pathname of the host file. The "/T=TXT" part indicates a text file in which lines are to be ended with a carriage return and line feed.

18.9 When asked for the MSDOS pathname you may press ***<ENTER>*** to transfer the data to a file called TEMP1.LIS on the CEO directory of the PC. Note that the MSDOS pathname must also have "/T=TXT" appended in order to obtain the required CR/LF line endings.

18.10 The file is now be transferred from the DG to the PC. Observe the bottom of the screen to determine the percentage of the file that has been transmitted at any stage.

18.11 After a successful transfer, type ***8*** at the menu to exit CEO-CONNECT, followed by ***Y*** to confirm your wish to exit.

18.12 Run DASHER, (or the like) to log off the LAN.

The method just outlined provides a secure way of transferring files from the DG MV20 000 computer to a PC. However, simpler methods can be used with most terminal emulators. With 'DASHER', press ***<ALT R>*** and enter a DOS pathname to create and open a file to receive the incomming data. Now type the DG command ***TYPE TEMP.LIS <ENTER>***, and the file will be listed on the screen and simultaneously captured on the file just opened. Press ***<ALT R>*** again to terminate the capture when the listing has finished. You may need to edit the captured file to remove the TYPE command included at the beginning, and the captured AOS prompt at the end. Similarly, if any messages from the operator should appear during the listing they will be embedded in the captured data. This may be prevented, however, with the AOS command ***char/off/nrm <ENTER>***. This method is often adequate for small amounts of data. WordStar (in non-document mode), or any other PC editor capable of editing ASCII files, may be used to edit the file on a PC.

19 - USING SQL TO UPDATE THE DATABASE

19.1 To make changes throughout a table, the SQL update statement is used. For example -

UPDATE SAMPLES
SET LITHOLOGY = 'metabasalt'
WHERE LITHOLOGY = 'metabasite';

The % symbol is very useful when updating character fields -

UPDATE SAMPLES
SET STRATUNIT = 'Timbuktu Formation'
WHERE STRATGROUP LIKE 'Timbuktu%'
AND STRATUNIT IS NOT NULL;

This will net "Timbuktu Group", "Timbuktu Sandstone", and any other variants that might exist. Note that the **LIKE** operator, rather than =, is required whenever the % symbol is used in this way.

19.2 When attempting an update, be sure to include the **WHERE** clause, otherwise **all** records in the database will be updated!

19.3 Actually, all is not lost - you can do a 'rollback'. Just type ***ROLLBACK*** and the last SQL command will be undone! That is, all records just updated will be 'backdated'.

19.4 When you are satisfied that the update has occurred according to plan (i.e. the message '25 000 records updated' does not appear when you were expecting about 2!), you must commit the changes by typing -

COMMIT <ENTER>

The reason for this is that anyone else using the table (e.g. from a form) will be suspended from any updates or inserts until you commit your update. Updates from SQL*PLUS place an exclusive lock on a table until a commit is executed, or until you log out of Oracle. You can't roll back after a commit.

19.5 To avoid the problem of locking other users out of the table for long periods when undertaking a series of updates on a single table, the data manager may invoke "shared-update mode" of locking a table. To do this to the SAMPLES table, for example, type -

LOCK TABLE SAMPLES
IN SHARE UPATE MODE
NOWAIT; <ENTER>

This lock applies until a COMMIT or ROLLBACK is invoked. Therefore, the correct method of proceeding with a shared update lock in place is to do all your updates before ***COMMIT*** is entered. Unfortunately, shared-update mode only applies to base tables, not to views. Because of this, it may be used only when logged into PetChem as the data manager. An exception is the REFERENCES table, to which all users have direct update priveleges.

19.5 If you wish to do any serious listing and updating you should spend a little time to acquaint yourself with SQL. See Anita Alps for an 'SQL Introduction' booklet.

19.6 To be able to use SQL properly you need to know the names of the relevant tables and the names of the columns in them. The relevant tables and their fields are listed at the back of these notes.

20 - PRINTING SAMPLE & GEOCHEMISTRY TABLES

In addition to spooled printouts of retrievals from SQL*PLUS, SQR programs are available for printing sample and rock chemical data. The geochemistry tables are in the conventional down-column format. These menu based programs can produce reports based on a variety of retrieval criteria.

20.1 From the DG operating system prompt, and after typing ***GEOCHEM <ENTER>***, type ***SAMPTABLE <ENTER>*** for the sample table, or ***CHEMTABLE <ENTER>*** for a table of major and trace elements.

20.2 Enter the required selection criteria into the menu that now presents itself. The report will be spooled to a file named in the menu.

20.3 When the SQR program has finished, to print the file on the DG's main printer, type -

QPR filename <ENTER>

The report can be collected from the pigeonholes in the computer room in half an hour or so.

20.4 To print the file on A4 landscape paper on a laser printer, type -

COPY @LPT2 filename

20.5 The SQR programs SAMPTABLE.SQR and CHEMTABLE.SQR are text files that may be edited with the DG's SED or SLATE editors. In this way you can modify their output to suit your requirements. First copy them to your own working directory with a copy command - e.g. -

COPY SAMPTABLE.SQR :UDD:ROD.DBASE:GEOCHEM:SAMPTABLE.SQR <ENTER>

21 - DIGITISING SAMPLE LOCATIONS

A facility exists in room 375 of BMR for digitising sample points from maps using an HP 9874A digitiser attached to a PC. The program generates ASCII output files, which have columns for sample number, easting and northing. It is intended that these be uploaded to the DG computer and then used to update the grid reference field in the samples table. However, the required SQR program is not yet written, and the coordinates must be entered by hand for the present. To digitise points on a map, proceed as follows -

21.1 Position the map on the digitiser and perform an 'axis align' operation. To do this press the 'axis align' key on the digitiser. Line the cursor on the x-axis (and E-W line on a map) and press the D - button on the cursor. Move to the other end of the line and press the D - button again.

21.2 Mark two diagonal points on the map and note their coordinates in the required units. These are the values (x1,y1) and (x2,y2) described below. The points should be as far apart as possible on the digitiser.

21.3 Run program DIGGR for grid reference output. For 1: 100 000 maps or smaller scale this is the only accurate way currently programmed for determining location. For larger scale maps, where grid convergence is negligible, use program DIGLL to output coordinates as decimal latitudes and longitudes.

21.4 The program now prompts for a filename. Enter a name for the file to contain the digitised data. The file must not already exist. DGGR will create two files, the name of the second preceded by an 'A' - e.g., 'MYFILE' and 'AMYFILE'. The first file contains eastings and northings to the nearest metre. In the second file (the one with the 'A' prefix), they are rounded to the nearest metres, as used by PETCHEM.

21.5 The program asks if an 'axis align' has been done. This question is only a memory jogger.

21.6 The program prompts for the scaling points. Place the 9874A cursor on the known point (x1,y1) and press the digitise button. The digitiser will give a beep. On the terminal enter the values of the coordinates that this point has in your coordinate system. Repeat for point (x2,y2).

21.7 Position the cursor over a point and press the 'digitise' button. The digitiser will beep and a prompt will appear on the PC for the sample number to be entered. Enter the number from the terminal. The value entered will complete the line displayed on the terminal. At this stage the field number and the grid reference are written to the output file.

21.8 To end the program, enter ***END*** as the field number of a dummy point from the session terminal. This line of data is not written to the file. The program stops.

APPENDIX A - PETCHEM DATABASE DEFINITIONS

```
CREATE SPACE DEFINITION SPACE GCSAMPLES
    DATAPAGES  ( INITIAL    2000,
                 INCREMENT  500,
                 MAXEXTENTS 9999,
                 PCTFREE    25    )
    INDEXPAGES ( INITIAL    200,
                 INCREMENT  100,
                 MAXEXTENTS 9999  )
    PARTITION C;


CREATE TABLE SAMPLES (
    ORIGNO              NUMBER  (5,0)    NOT NULL,
    SAMPNO              CHAR    (16)     NOT NULL,
    FIELDNO             CHAR    (16),
    STRATGROUP          CHAR    (64),
    SUBGROUP            CHAR    (64),
    STRATUNIT           CHAR    (64),
    STRATMEMBER         CHAR    (64),
    STRATHEIGHT         NUMBER  (8,2),
    MAPSYMBOL           CHAR    (10),
    ROCKNO              NUMBER  (5,0),
    LITHOLOGY           CHAR    (64),
    GROUPING            CHAR    (22),
    AGE                 CHAR    (64),
     REFNO1              NUMBER  (5,0),
     REFNO2              NUMBER  (5,0),
     REFNO3              NUMBER  (5,0),
     REFNO4              NUMBER  (5,0),
     REFNO5              NUMBER  (5,0),
    COUNTRYID           CHAR    (3),
    STATE               CHAR    (3),
    REGIONO             NUMBER  (5,0),
    GEOGAREA            CHAR    (64),
    LOCALITY            CHAR    (64),
    MAPNO               NUMBER  (4,0),
    AIRPHOTO            CHAR    (22),
    GRIDREF             CHAR    (10),
    DLAT                NUMBER  (8,6),
    NS                  CHAR    (1),
    DLONG               NUMBER  (9,6),
    EW                  CHAR    (1),
    DRILLHOLE           CHAR    (22),
    DEPTH               CHAR    (10),
    OTHERDATA           CHAR    (64),
    ENTRYDATE           DATE             )
SPACE SPACE_GCSAMPLES;


CREATE UNIQUE INDEX ORIGSAMP ON SAMPLES ( ORIGNO, SAMPNO );
CREATE        INDEX SAMPLENO ON SAMPLES ( SAMPNO );
CREATE        INDEX REGIONS  ON SAMPLES ( REGIONO );
CREATE        INDEX HMAPS    ON SAMPLES ( MAPNAME );
```

```
CREATE SPACE DEFINITION SPACE GCSPLITS
    DATAPAGES  ( INITIAL    500,
                 INCREMENT  250,
                 MAXEXTENTS 9999,
                 PCTFREE    25    )
    INDEXPAGES ( INITIAL    150,
                 INCREMENT  100,
                 MAXEXTENTS 9999  )
    PARTITION C;


CREATE TABLE SAMPSPLITS (
    ORIGNO              NUMBER  (5,0) NOT NULL,
    SAMPNO              CHAR    (16)  NOT NULL,
    SAMPTYPENO          NUMBER  (5,0) NOT NULL,
    STOREBOXNO          NUMBER  (5,0)  )
SPACE SPACE_GCSPLITS;

CREATE INDEX SAMPORIG ON SAMPSPLITS ( ORIGNO, SAMPLENO );
CREATE INDEX SPLITYPE ON SAMPSPLITS ( SAMPTYPENO );



CREATE SPACE DEFINITION SPACE GCMAJORS
    DATAPAGES  ( INITIAL    1000,
                 INCREMENT  400,
                 MAXEXTENTS 9999,
                 PCTFREE    10    )
    INDEXPAGES ( INITIAL    200,
                 INCREMENT  100,
                 MAXEXTENTS 9999  )
    PARTITION C;

CREATE TABLE MAJORS  (
    ORIGNO        NUMBER (5,0)   NOT NULL,
    SAMPNO        CHAR   (16)    NOT NULL,
    ANALNO        NUMBER (5,0)   NOT NULL,
    SOURCENO      NUMBER (5,0),
    METHODNO      NUMBER (5,0),
    SIO2          NUMBER (4,2),
    TIO2          NUMBER (4,2),
    AL2O3         NUMBER (4,2),
    FE2O3TOT      NUMBER (4,2),
    FE2O3         NUMBER (4,2),
    FEO           NUMBER (4,2),
    MNO           NUMBER (4,2),
    MGO           NUMBER (4,2),
    CAO           NUMBER (4,2),
    NA2O          NUMBER (4,2),
    K2O           NUMBER (4,2),
    P2O5          NUMBER (4,2),
    H2OPLUS       NUMBER (4,2),
    H2OMIN        NUMBER (4,2),
    CO2           NUMBER (4,2),
    LOI           NUMBER (4,2),
    REST          NUMBER (4,2),
    TOTAL         NUMBER (5,2),
    ENTRYDATE     DATE           )
SPACE SPACE_GCMAJORS;

CREATE UNIQUE INDEX MANALNO   ON MAJORS ( ANALNO );
CREATE        INDEX MORIGSAMP ON MAJORS ( ORIGNO, SAMPNO );
CREATE        INDEX MSAMPLENO ON MAJORS ( SAMPNO );
```

```
CREATE SPACE DEFINITION SPACE GCTRACES
    DATAPAGES   ( INITIAL    1700,
                  INCREMENT  400,
                  MAXEXTENTS 9999,
                  PCTFREE    30    )
    INDEXPAGES  ( INITIAL    200,
                  INCREMENT  100,
                  MAXEXTENTS 9999  )
    PARTITION C;


CREATE TABLE TRACES  (
    ORIGNO       NUMBER (5,0)          NOT NULL,
    SAMPNO       CHAR   (10)           NOT NULL,
    ANALNO       NUMBER (5,0)          NOT NULL,
    SOURCENO     NUMBER (5,0),
    METHODNO     NUMBER (5,0),
    AG           NUMBER (8,2),
    AL           NUMBER (8,2),
    ARS          NUMBER (8,2),
    AU           NUMBER (8,2),
    B            NUMBER (8,2),
    BA           NUMBER (8,2),
    BE           NUMBER (8,2),
    BI           NUMBER (8,2),
    BR           NUMBER (8,2),
    C            NUMBER (8,2),
    CA           NUMBER (8,2),
    CD           NUMBER (8,2),
    CE           NUMBER (8,2),
    CL           NUMBER (8,2),
    CO           NUMBER (8,2),
    CR           NUMBER (8,2),
    CS           NUMBER (8,2),
    CU           NUMBER (8,2),
    DY           NUMBER (8,2),
    ER           NUMBER (8,2),
    EU           NUMBER (8,2),
    F            NUMBER (8,2),
    FE           NUMBER (8,2),
    GA           NUMBER (8,2),
    GE           NUMBER (8,2),
    GD           NUMBER (8,2),
    HF           NUMBER (8,2),
    HG           NUMBER (8,2),
    HO           NUMBER (8,2),
    IR           NUMBER (8,2),
    K            NUMBER (8,2),
    LA           NUMBER (8,2),
    LI           NUMBER (8,2),
    LU           NUMBER (8,2),
    MG           NUMBER (8,2),
    MN           NUMBER (8,2),
    MO           NUMBER (8,2),
    NA           NUMBER (8,2),
    NB           NUMBER (8,2),
    ND           NUMBER (8,2),
    NI           NUMBER (8,2),
    OS           NUMBER (8,2),
    P            NUMBER (8,2),
    PB           NUMBER (8,2),
    PD           NUMBER (8,2),
    PR           NUMBER (8,2),
    PT           NUMBER (8,2),
    RB           NUMBER (8,2),
```

```
    S           NUMBER (8,2),
    SB          NUMBER (8,2),
    SE          NUMBER (8,2),
    SC          NUMBER (8,2),
    SI          NUMBER (8,2),
    SM          NUMBER (8,2),
    SN          NUMBER (8,2),
    SR          NUMBER (8,2),
    TA          NUMBER (8,2),
    TB          NUMBER (8,2),
    TE          NUMBER (8,2),
    TI          NUMBER (8,2),
    TH          NUMBER (8,2),
    TL          NUMBER (8,2),
    TM          NUMBER (8,2),
    U           NUMBER (8,2),
    V           NUMBER (8,2),
    W           NUMBER (8,2),
    Y           NUMBER (8,2),
    YB          NUMBER (8,2),
    ZN          NUMBER (8,2),
    ZR          NUMBER (8,2),
    ENTRYDATE   DATE         )
SPACE SPACE_GCTRACES;

CREATE UNIQUE INDEX TANALNO   ON TRACES ( ANALNO );
CREATE        INDEX TORIGSAMP ON TRACES ( ORIGNO, SAMPNO );
CREATE        INDEX TSAMPLENO ON TRACES ( SAMPNO );
```

```
CREATE SPACE DEFINITION SPACE GCSMALL
    DATAPAGES  ( INITIAL    50,
                 INCREMENT  50,
                 MAXEXTENTS 9999,
                 PCTFREE    25    )
    INDEXPAGES ( INITIAL    20,
                 INCREMENT  12,
                 MAXEXTENTS 9999  )
    PARTITION C;



CREATE TABLE PPB (
        ORIGNO          NUMBER (5,0)     NOT NULL,
        SAMPNO          CHAR   (16)      NOT NULL,
        ANALNO          NUMBER (5,0)     NOT NULL,
        SOURCENO        NUMBER (5,0),
        METHODNO        NUMBER (5,0),
        SE              NUMBER (8,3),
        RB              NUMBER (8,3),
        RU              NUMBER (8,3),
        RH              NUMBER (8,3),
        PD              NUMBER (8,3),
        AG              NUMBER (8,3),
        CS              NUMBER (8,3),
        LA              NUMBER (8,3),
        CE              NUMBER (8,3),
        PR              NUMBER (8,3),
        ND              NUMBER (8,3),
        PM              NUMBER (8,3),
        SM              NUMBER (8,3),
        EU              NUMBER (8,3),
        GD              NUMBER (8,3),
        TB              NUMBER (8,3),
        DY              NUMBER (8,3),
        HO              NUMBER (8,3),
        ER              NUMBER (8,3),
        TH              NUMBER (8,3),
        YB              NUMBER (8,3),
        LU              NUMBER (8,3),
        RE              NUMBER (8,3),
        OS              NUMBER (8,3),
        IR              NUMBER (8,3),
        PT              NUMBER (8,3),
        AU              NUMBER (8,3)
        ENTRYDATE         DATE           )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX PPBANALNO   ON PPB ( ANALNO );
CREATE        INDEX PPBORIGSAMP ON PPB ( ORIGNO, SAMPNO);
CREATE        INDEX PPBSAMPLENO ON PPB ( SAMPNO );


CREATE TABLE ROCKTYPES  (
        ROCKNO          NUMBER (5,0)     NOT NULL,
        ROCKTYPE        CHAR   (64)      NOT NULL  )
SPACE SPACE_GCSMALL;
```

```
CREATE TABLE REFERENCES (
        REFNO           NUMBER (5,0) NOT NULL,
        OTHERID         CHAR   (16),
        USERNAME        CHAR   (16),
        AUTHORS         CHAR   (128),
        YEAR            CHAR   (16),
        TITLE           CHAR   (240),
        SOURCE          CHAR   (240)   )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX REFNUMBER ON REFERENCES ( REFNO );
CREATE UNIQUE INDEX REFUNIQUE ON REFERENCES ( AUTHORS, YEAR );

CREATE TABLE ORIGINATORS  (
        ORIGNO          NUMBER  (5,0)   NOT NULL,
        ORIGINATOR      CHAR    (22)    NOT NULL   )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX ORIGNOS ON ORIGINATORS ( ORIGNO );
CREATE UNIQUE INDEX ORIGINS ON ORIGINATORS ( ORIGNATOR );



CREATE TABLE REGIONS  (
        REGIONO         NUMBER (5,0)    NOT NULL,
        REGION          CHAR   (64)     NOT NULL  )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX REGIONO   ON REGIONS ( REGIONO );
CREATE UNIQUE INDEX REGIONAME ON REGIONS ( REGION );



CREATE TABLE HMAPS  (
        HMAPNO          NUMBER (4,0)
        HMAPID          CHAR   (4),
        QMAPNO          NUMBER (2,0),
        N_LAT           NUMBER (3,1),
        W_LONG          NUMBER (4,1),
        MEAST           NUMBER (6),
        MNORTH          NUMBER (7)    )
SPACE SP_LOCAL;

CREATE UNIQUE INDEX HMAPNO   ON HMAPS ( HMAPNO );
CREATE        INDEX HMAPNAME ON HMAPS ( HMAPNAME );
CREATE        INDEX NLAT     ON HMAPS ( N_LAT );
CREATE        INDEX WLONG    ON HMAPS ( W_LONG );



CREATE TABLE SAMPLETYPES (
        SAMPTYPENO      NUMBER(5,0)     NOT NULL,
        SAMPLETYPE      CHAR (64)       NOT NULL  )
SPACE SPACE_GCSMALL;



CREATE TABLE SOURCES  (
        SOURCENO        NUMBER (5,0)    NOT NULL,
        SOURCE          CHAR   (64)     NOT NULL  )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX SOURCENOS ON SOURCES ( SOURCENO );
CREATE UNIQUE INDEX SOURCES   ON SOURCE  ( SOURCE );
```

```
CREATE TABLE METHODS  (
        METHODNO          NUMBER (5,0)     NOT NULL,
        METHOD            CHAR   (64)      NOT NULL  )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX METHODNO ON METHODS ( METHODNO );
CREATE UNIQUE INDEX METHOD   ON METHODS ( METHOD );



CREATE TABLE STOREBOXES  (
        BOXNO             NUMBER (5,0)    NOT NULL,
        ORIGNO            NUMBER (5,0),
        FROMSAMPNO        CHAR   (16),
        TOSAMPNO          CHAR   (16),
        PROJECT           CHAR   (64)   )
SPACE SPACE_GCSMALL;

CREATE UNIQUE INDEX STOREBOXNOS ON STOREBOXES (BOXNO);



CREATE TABLE MAXNOS  (
        IDMAXNO           CHAR   (16)      NOT NULL,
        MAXNO             NUMBER (6,0)     NOT NULL  )
SPACE SPACE_GCSMALL;
```

APPENDIX B - DATA IN AUTHORITY TABLES AS AT 01-03-90

```
SQL> SELECT * FROM ORIGINATORS ORDER BY ORIGINATOR;

    ORIGNO ORIGINATOR
---------- --------------------
        77 ANU RSES
        78 Allen, A.R.
        98 Bagas, L.
        51 Bain, J.H.C.
        55 Bettenay, L.
        56 Black, L.P.
         2 Blake, D.H.
        79 Bofinger, V.M.
         3 Branch, C.D.
         4 Bultitude, R.J.
        25 Chapple, K.
        88 Chin, R.J.
        95 Compston,W.
        35 Cook, P.
        82 Cooper, J.A.
        64 Crick, I.
         6 Croxford, W.
         7 Cruikshank, B.I.
        10 Dallwitz, W.B.
        11 Derrick, G.M.
       101 Dobos, S.K.
        12 Duff, B.
        75 Duggan, M.B.
        13 Ellis, D.J.
        14 England, R.N.
        28 Etheridge, M.
        15 Ewers, G.R.
        58 Ferguson, J.
       102 Foden, J.D.
        96 Freeman, M.J.
         5 Gardner, C.
        80 Gee, R.D.
        17 Glikson, A.Y.
        85 Gray, C.M.
        59 Hegge, M.R.
        33 Higgins, N.C.
        19 Hill, R.M.
        65 Hills, J.
         8 Hoatson, D.M.
        20 Holmes, R.D.
        21 Hutton, L.J.
        94 Jagodzinski, E.A.
        24 Jaques, A.L.
        52 Johnson, R.W.
        99 Joklik, G.F.
        63 Joplin, G.
        87 K.L. Currie
        23 Knutson, J.
       100 Korsch, R.
        81 Laeter, J.R. de
        22 Lambert, I.
        92 Langworthy, A.P.
        27 Lewis, J.D.
        86 Ludwig, K.R.
        29 Mackenzie, D.E.
        90 Marjoribanks, R.W.
        30 McNaughton, N.
        54 Miller, A.
        31 Mitchell, J.M.
        32 Mock, C.M.
        89 Mortimer, G.E.
        40 Needham, R.S.
```

```
        97 Offe, L.A.
        34 Oversby, B.S.
        37 Page, R.W.
        57 Pederson, C.P.
       104 Pidgeon, R.T.
        38 Plumb, K.A.
        66 Rhodes, J.
       103 Roarty, M.J.
        61 Roberts, W.M.B.
        93 SADME
        41 Santul, J.
        69 Shaw, R.D.
        42 Sheraton, J.W.
        67 Smart, P.
        43 Smith, S.E.
        70 Stewart, A.J.
        74 Stratton, J.
        73 Stuart, J.E.
        36 Stuart-Smith, P.G.
        68 Sweet, I.P
        18 Tanaka, H.
        44 Tunks, A.
        39 Valenta, R.
       105 W.A. Geological Survey
        45 Wallace, D.A.
        62 Walpole, B.
        16 Warren, R.G.
        72 Watchman, A.
        91 Webb, A.W.
        60 Wilkes, P.G.
        53 Williams, P.R.
        83 Williams, S.J.
        46 Willmott, W.F.
        47 Wilson, I.H.
        84 Windrim, D.P.
        48 Withnall, I.W.
        49 Wyborn, D.
        50 Wyborn, L.A.I.
        71 Wyche, S.
        76 Yeates, A.N.
         1 unknown

103 records selected.


SQL> SELECT * FROM SAMPLETYPES;

SAMPTYPENO SAMPLETYPE
---------- ------------------------------------------------------------
         1 unknown
         2 whole-rock chemistry
         3 geochronology
         4 hand specimen
         5 thin section
         6 geochronology K-Ar
         7 geochronology Ar-Ar
         8 geochronology Rb-Sr
         9 geochronology Sm-Nd
        10 geochronology U-Pb Minerals
        11 geochronology U-Pb SHRIMP
        12 geochronology Pb-Pb
        13 geochronology Pb-Pb ores
        14 geochronology Lu-Hf
        15 geochronology Re-Os
        16 geochronology fission-track
        17 geophysical properties

17 records selected.
```

```
SQL> SELECT * FROM REGIONS ORDER BY REGION;

   REGIONO REGION
---------- ------------------------------------------------------------
         2 Adelaide Fold Belt
         3 Albany-Fraser Province
        68 Amadeus Basin
        69 Ammaroodinna Inlier
         4 Arunta Block
        54 Ashburton Trough
        65 Bangemall Basin
        64 Birrindudu Basin
         5 Bunger Hills
         6 Cape York Peninsula
        53 Capricorn Orogen
         7 Carnarvon Basin
         8 Commonwealth Bay
         9 Cummins Range
        10 Davenport Province
        11 Denman Glacier
        57 Earaheedy Sub-basin
        12 East Kimberley
        52 Eastern Goldfields
        13 Enderby Land
        55 Gascoyne Province
        14 Gawler Craton
        15 George V Land
        16 Georgetown Inlier
        56 Glengarry Sub-basin
        36 Granites-Tanami Block
        17 Halls Creek Inlier
        48 Hammersley Basin
        18 Kemp Land
        19 Lachlan Fold Belt
        20 Lawn Hill Platform
        63 Manus Island
        21 Mawson Coast
        22 McArthur Basin
        23 Mount Isa Inlier
        58 Murphy Tectonic Ridge
        66 Musgrave Block
        25 NE Queensland
        26 NE Tasmania
        27 NW Tasmania
        61 New England Fold Belt
        51 New Georgia Island
        30 North Kimberley
        29 North Victoria Land
        24 Northern Prince Charles Mountains
        67 Paterson Province
        31 Pilbara Block
        32 Pine Creek Inlier
        33 Prydz Bay Coast
        49 SE Tasmania
        50 SW Tasmania
        59 South Nicholson Basin
        34 Southern Prince Charles Mountains
        35 Stuart Shelf
        62 Sydney Basin
        37 Tasman Fold Belt
        38 Tasmania
        39 Tennant Creek
        40 Turee Creek
        41 Tuross
        42 Vestfold Hills
        43 West Kimberley
        60 Westmoreland Region
        44 Wilhelm II Land
```

```
        45 Wilkes Land
        46 Willyama Block
        47 Yilgarn Block
         1 unknown

68 records selected.


SQL> SELECT * FROM ROCKTYPES;

    ROCKNO ROCKTYPE
---------- ------------------------------------------------------------
         1 unknown
         2 felsic intrusive
         3 intermediate intrusive
         4 mafic intrusive
         5 felsic extrusive
         6 intermediate extrusive
         7 mafic extrusive
         8 ultramafite
         9 alkaline igneous
        10 clastic sediment
        11 chemical sediment
        12 metabasite
        13 felsic gneiss
        14 metasediment
        15 metasomatite
        16 ore
        17 regolith
        18 mixed clastic/chemical sediment

18 records selected.


SQL> SELECT * FROM SOURCES;

  SOURCENO SOURCE
---------- ------------------------------------------------------------
         1 unknown
         3 ANU
         4 Adelaide University
         5 AMDEL
         6 BMR
         7 BMR restricted
         8 CSIRO/BMR
         9 Macquarie University
        10 Melbourne University
        11 NTGS (AMDEL)
        12 Western Australian Government Chemical Laboratories
        13 UWA/BMR Restricted
        14 University of Queensland
        15 James Cook University of North Queensland
        16 Tasmanian Department of Mines
        17 University of Tasmania
        18 Queensland Department of Mines
        19 BGR (Bundesanstalt fur Geowissenschaften und Rohstoffe)
        20 Labtech Pty. Ltd., WAIT, WA Govt. Chem. Lab., Perth.
        21 Institute for Petrology, Copenhagen University, Denmark.

20 records selected.
```

```
SQL> SELECT * FROM METHODS;

METHODNO METHOD
-- ------------------------------------------------------------
 1 unknown
 2 XRF (Norrish & Hutton, 1969); FeO Vol.; LOI Grav.
 3 XRF (Norrish & Hutton, 1969); FeO Vol.; H2O+, H2O-, & CO2 Grav.
 4 XRF (Norrish & Chappell, 1977); Ag, Be, Co, Li by AAS
 5 XRF (Norrish & Chappell, 1977);Ag, Be, Co, Cu, Li, Ni, Zn by AAS
 6 XRF (Norrish & Hutton, 1969); FeO, H2O(total), CO2 by AMDEL
 7 XRF (Norrish & Chappell, 1967); Li Be Cr Co Ni Cu Zn Sn F AMDEL
 8 Rb, Sr by XRF (Norrish & Chappell, 1967); Ni, Co, V by AAS
 9 XRF (Norrish & Chappell, 1977); FeO vol.; LOI grav.
10 XRF (N & C, 1977); REE Hf Ta Cr Sc Sb Cs INA; Th U Gamma spectrm
11 XRF (N & C, 1977); REE Hf Ta Sb Cs INA; U delayed neutron count
12 XRF (Norrish & Chappell, 1977).
13 XRF (Norrish & Chappell, 1977); Co Cu Ni Pb Zn by emiss. spectrm
14 ICP,AES Inductively Coupled Plasma, Atomic Emission Spectroscopy
15 XRF (N & C, 1977) at ANU; Na, K by AAS (JCUNQ).
16 XRF(N&C 1977) UQ; REE Th U Pb Hf Ba Cs Sn Mo Nb Y Bi W MS7 RSES.
17 AMDL `wet' chem. +/- XRF (N & H, 1969)?
18 Tas. Dept. Mines Assay Labs Launceston: "classical methods".
19 J. Klominsky & D.I. Groves: X-ray spectrography.
20 XRF (Norrish & Chappell, 1977); REE,Sc,Hf,Th,U INAA
21 XRF (N & C, 1977); REE ion-exchange/XRF (Robinson & others,1986)
22 AMACHEM Nickel sulfide assay- neutron activation.

22 records selected.
```

APPENDIX C - A SQL SELECT STATEMENT AND ITS OUTPUT

```
SQL> SELECT SAMPNO, GRIDREF, SIO2, AL2O3, FE2O3, FEO, MGO,
CAO, NA2O, K2O
  2    FROM SAMPLES, MAJORS
  3      WHERE REGIONO    = 23
  4        AND STRATUNIT = 'Argylla Formation'
  5        AND MAPNO     = 6856              - [Mary Kathleen Sheet]
  6        AND MAJORS.ORIGNO = SAMPLES.ORIGNO
  7        AND MAJORS.SAMPNO = SAMPLES.SAMPNO
  8    ORDER BY SAMPLES.SAMPNO;
```

SAMPNO	GRIDREF	SIO2	AL2O3	FE2O3	FEO	MGO	CAO	NA2O	K2O
70201205	788071	70.00	12.10	2.76	2.05	1.00	0.95	2.90	6.30
70201208	804077	72.00	11.60	4.50		0.41	0.30	1.00	8.60
70201209	804065	70.00	11.65	2.36	1.38	0.72	2.60	2.30	6.30
70201213	773009	70.50	12.10	4.70		0.82	1.05	2.30	6.80
70201235	752266	68.50	12.10	5.51	2.54	0.85	0.62	3.40	5.10
70201258	948300	72.00	11.30	3.64	2.40	0.38	1.03	2.40	5.50
71201286	805203	76.00	10.50	3.10		-0.01	0.25	1.95	6.90
71201333	906135	66.50	13.30	4.37	1.92	1.08	1.95	3.50	5.60
71201342	893163	75.00	11.40	2.50	0.56	-0.01	0.85	3.40	4.80
71201383	877230	68.00	13.30	4.51	1.10	0.67	1.05	2.65	7.10
71201393	905088	69.00	11.50	6.08	2.80	0.24	0.77	2.40	6.30
71201395	846242	71.00	13.10	1.84	1.85	0.57	2.10	2.35	5.60
71201573	696004	71.50	14.30	2.36	1.05	0.40	2.70	2.10	4.50
71201575	840921	69.50	13.00	4.29	1.35	0.60	1.40	1.30	7.50
71201576	787869	71.00	12.50	3.22	1.64	0.20	2.10	2.20	5.50
71201579	758782	69.50	13.70	4.89	0.57	0.50	2.90	1.90	4.60
80204323	894213	67.50	12.40	5.48	0.82	0.77	1.70	1.27	7.20
80204324	918197	70.70	11.90	4.15	0.82	0.24	0.68	2.96	5.82
80204325	939209	69.10	12.80	3.38	1.73	0.21	2.03	2.58	5.95
80204343	935254	68.70	12.50	2.95	2.77	0.51	1.88	2.66	5.65
80204344	943166	70.30	13.10	2.21	2.71	0.58	1.81	2.75	5.05
80204345	944166	69.50	13.30	2.63	2.94	0.58	3.41	3.85	2.15
80209004	757196	68.70	12.80	3.95	2.85	0.62	0.78	3.90	4.35
80209005	757196	68.20	11.40	7.25	2.85	0.14	0.21	2.60	5.75
80209006	757196	67.30	12.70	4.55	2.60	0.78	1.28	1.96	6.70
80209007	803062	71.80	12.60	3.75	1.18	0.44	0.81	2.50	4.85
80209008	756084	69.40	12.90	2.90	2.30	0.59	1.00	2.00	6.90
80209009	758084	68.40	12.50	4.15	2.05	0.85	0.51	1.46	7.80
80209012	895207	70.70	12.90	2.95	1.21	0.31	0.67	3.05	6.55
80209013	894213	66.60	13.90	4.35	2.55	0.78	1.55	2.65	5.40
80209014	894217	72.80	12.00	2.40	1.45	0.54	0.68	1.34	7.15
80209015	818228	69.80	13.10	3.30	1.87	0.83	0.78	1.56	6.70
80209016	939209	72.10	12.30	2.25	2.20	0.28	1.65	1.88	5.40
80209017	936253	75.90	11.80	1.28	0.55	0.23	0.79	1.94	6.10
80209018	936253	69.80	12.20	3.35	2.60	0.48	1.79	2.30	5.30
80209037	952922	68.80	12.60	4.21	1.54	0.27	0.67	0.93	9.50
80209038	954920	70.40	13.00	5.01	1.70	0.34	1.64	6.27	0.32

APPENDIX D - THE SMALLCHEM SQL COMMAND FILE.

```
SET PAGESIZE 50000;
SET ARRAYSIZE 5;
SPOOL TEMP1;

SELECT  SAMPLES.REGIONO, REGION, GEOGAREA,
        SAMPLES.ORIGNO, ORIGINATORS.ORIGINATOR,
        SAMPLES.SAMPNO, STRATGROUP, SUBGROUP,
        STRATUNIT, ROCKNO, GROUPING, MAPSYMBOL,
        LITHOLOGY, MAPNAME, GRIDREF,
        DRILLHOLE, DEPTH, AGE, OTHERDATA,
        SIO2, TIO2, AL2O3, FE2O3, FEO, MNO, MGO,
        CAO, NA2O, K2O, P2O5, H2OPLUS, H2OMIN, CO2,
        BA, LI, RB, SR, PB, TH, U, ZR, NB, Y, LA,
        CE, PR, ND, SC, V, CR, MN, CO, NI, CU, ZN,
        SN, W, MO, GA, ARS, S, C, F, CL, B, AG, AU,
        BI, GE, BE, SE, CS,
        DLAT, DLONG
FROM SAMPLES, MAJORS, TRACES, ORIGINATORS, REGIONS
WHERE ((samples.SAMPNO      = majors.SAMPNO (+))
       and (samples.ORIGNO = majors.ORIGNO(+)))
AND   ((samples.SAMPNO      = traces.SAMPNO(+))
       and (samples.ORIGNO = traces.ORIGNO (+)))
AND   originators.ORIGNO    = samples.ORIGNO
AND   regions.REGIONO       = samples.REGIONO;

SPOOL OFF;
```

APPENDIX F - OVERLAY FOR DG TERMINAL

Next field	NL;CR;Tab	*Next field*
Next primary key field	C3	*Select*
Next record	↓	*Down*
Next set of records	C4	*Define*
Next block	C2	*Select block*

Previous field	Home; ^H	*Previous field*
Previous record	↑	*Up*
Previous block	C1	*Accept*
Delete backwards	DEL	*Delete backwards*
Clear field	ERASE EOL; ^K	*Clear field*
Print	CMD-PRINT	*Print*

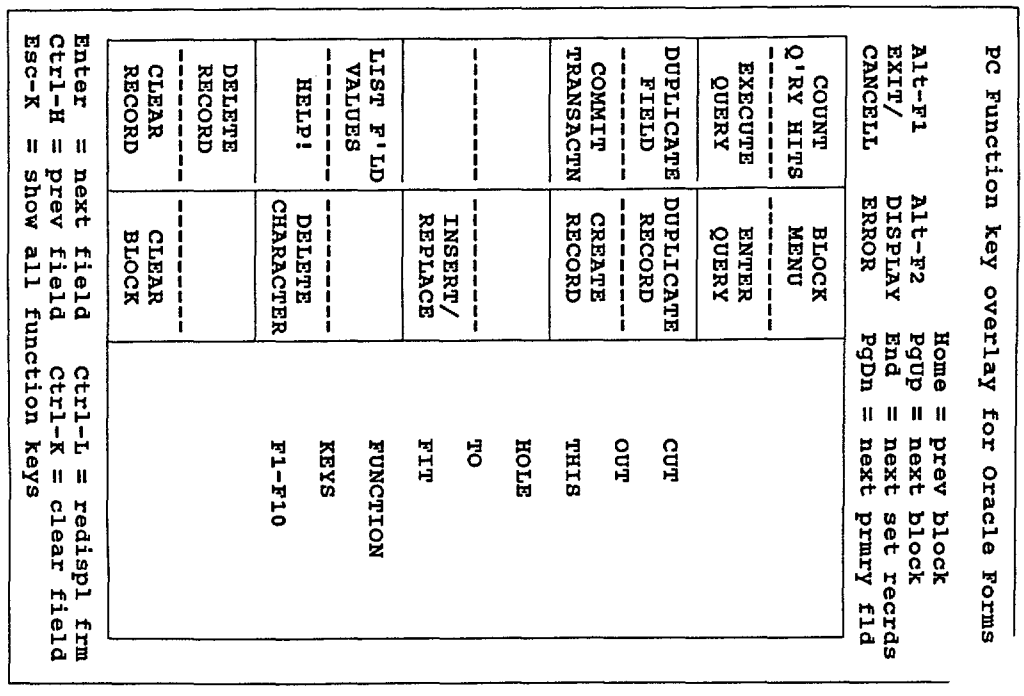
					SHIFT	*Run-option window*				
		Accept				*Insert/ replace*		*Delete character*		
Count query hits	Block menu	Duplicate field	Duplicate record		SHIFT		List field values		Delete record	
Execute query	Enter query	Commit transaction	Create record			Insert/ replace	HELP	Delete character	Clear record	Clear block

ORACLE DESIGNER TEMPLATE

	Exit/ Cancel	Display Error			
SHIFT	Clear form/ Rollback	Show FUNCT keys			
	Exit/ Cancel		*Cut*	*Draw box/ line*	*Create field*
SHIFT		*Show FUNCT keys*	*Paste*	*Undo*	*Resize field*

Show function keys	ESCape k	
Redisplay page	ERASE PAGE;^L;ESCape r	
Scroll left	Shift ←	
Scroll right	Shift →	
Left	←	*Left*
Right	→	*Right*

APPENDIX G - OVERLAY FOR WYSE TERMINAL



PC/AT function key overlay for Oracle Forms

Home = prev block, PgUp = next block,

COUNT Q'RY HITS	BLOCK MENU	DUPLICATE RECORD	DUPLICATE RECORD
EXECUTE QUERY	ENTER QUERY	COMMIT TRANSACTN	CREATE RECORD

		LIST F'LD VALUES	
	INSERT/ REPLACE	HELP!	DELETE CHARACTER

CUT OUT THESE HOLES TO FIT OVER

FUNCTION KEYS F1 -12 ON A PC/AT

, End = next primary key fld, PgDn = next set of record

DELETE RECORD		CLR FORM ROLLBACK	SHOW FUNC KEYS
CLEAR RECORD	CLEAR BLOCK	EXIT/ CANCELL	DISPLAY ERROR

Enter = next field
Ctrl-H = prev field
Ctrl-L = redisplay
Ctrl-K = clr field
Esc-K = clr field

WITH AN EXTENDED KEYBOARD

APPENDIX F - OVERLAYS FOR IBM PC-XT & AT