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NATURAL ENVIRONMENT RESEARCH COUNCIL

The G-BASE field database

Economic Minerals and Baseline Geochemistry Programme
Internal Report IR/05/001

BRITISH GEOLOGICAL SURVEY

ECONOMIC MINERALS AND BASELINE GEOCHEMISTRY PROGRAMME

INTERNAL REPORT IR/05/001

The G-BASE field database

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Contents

FIGURES

TABLES

PHOTOGRAPHS

Summary

Since the 1960s British Geological Survey (BGS) geochemists have routinely recorded site and sample information on field cards. The Geochemical Baseline Survey of the Environment (G-BASE) Project completes a field card for every site sampled and, from the 1980s onwards, field data have been entered into a field database as the samples were collected. In the 1990s a corporate Geochemistry Database was set up using ORACLE to encompass all geochemical data gathered throughout BGS for the UK landmass, including sample and site information. This required a standardisation of coding on field cards both within geochemical activities and in relation to the use of BGS codes, for example the description of rocks and minerals.

In order to load all the data from the G-BASE field cards it is necessary to coordinate the process from completing the card on location; inputting data into the field database, and to the concluding process of loading the field data to the BGS corporate Geochemistry Database. In the past there have been some incompatibilities between the field and corporate database so not all the field data were being captured into the Geochemistry Database.

This report describes new and revised protocols to be used throughout the process of G-BASE field data gathering and to populating the Geochemistry Database. It details the codes that are to be used and the translations that are necessary to transfer from the G-BASE format to Geochemistry Database format. The history of the use of field forms and field databases in G-BASE is described. This manual establishes a reference point in the field data gathering process from which future changes can be documented.

The report appendices list some of the more useful domain tables from the Geochemistry Database and give worked examples of how field information can be used to retrieve analytical results from the database.

1 Introduction

This report describes the Geochemical Baseline Survey of the Environment (G-BASE) field database that in its current form is based on a Microsoft Access relational database created for each yearly field campaign. The historical development of the G-BASE field database is discussed and significant changes in the reporting of site information during the lifetime of the project are documented.

The field database is merely the digital representation of the field cards completed at each site by the sample collectors. The field cards are therefore described in detail with an item-by-item guide to completing them.

Field data are transferred to the BGS Geochemistry Database, a corporate relational database stored in ORACLE (Coats, 2004 and Johnson et al, 2004). The procedure for doing this is described here. The transfer of the digital G-BASE field data into the BGS ORACLE database is a process that has not been as simple and straightforward as it should have been due to different coding systems in use and the absence of some domains in the Geochemistry Database necessary for storing all the field data. This report seeks to address some of the issues concerning the transfer of field data to the Geochemistry Database and make this task a simpler process. It is important that all G-BASE field observation are captured to the Geochemistry Database, something that has not been routinely done in the past.

1.1 VERSION CONTROL

A critical part of field data management is the control and documentation of protocols and code versions. This documentation is seen as a baseline from which future changes and modifications can be referenced. Important aspects of version control are:

a) ***The field procedures protocol***. From 2003 all fieldwork protocols are documented in an internal BGS report as a G-BASE field procedures manual. Each field sampling campaign can be linked to a set of protocols by the field protocols code, a field that is completed on each field card and listed in the Geochemistry Database Domain table BGS_DIC_GBASE_SAMPLING_PROTOCOL (see Table 1).

CODE	TRANSLATION	DEFINED_AS
XX	Pre-1998 documentation	Procedures carried out pre Flight & Lister (1998). For sampling protocols read respective regional geochemical atlas
98	Flight & Lister (1998)	Flight & Lister (1998) G-BASE Field Procedures Manual Draft v2
03	Johnson et al (2003)	Johnson et al (2003) G-BASE Field Procedures Manual v1.1
04	Johnson (2004)	Johnson (2004) 2004 G-BASE Field Procedures Manual
05	Johnson (2005)	Johnson (2005) 2005 G-BASE Field Procedures Manual

Table 1: Field Procedure Protocol codes

b) ***The field card code version.*** This is a description found on the bottom of G-BASE field cards and coded in the Geochemistry Database domain table (BGS_MTA_DOM_CODE_VERSION - see Appendix 1:). This is discussed in the next section. The field card version and the field database are linked and one should not be updated without the other.

It is the responsibility of the G-BASE data manager (or the nominated deputy) to maintain documentation of the protocols for data gathering and the codes used on the field cards and in the database. Until a revised version of this report is produced, updates should be documented and held on file by the data manager.

2 Field cards

2.1 HISTORY OF G-BASE FIELD CARDS

BGS geochemical survey field data has been documented on some type of form known as a "field card" since the late 1960s. For every sample collected, identified by a unique project code and sample number, a series of associated field observations have systematically been made, ranging from fundamental information such as grid reference and sample types to varied observations on site and sample conditions and attributes. Over the years the detailed layout of the field card has evolved as the number and types of observations recorded have changed and expanded. However, the aim of recording varied site/sample observational information in a systematic abbreviated form that can be readily translated into digital storage media, and may, thereafter, be used in geochemical interpretation has remained a fundamental part of the survey.

The historical management and reorganisations of geochemical surveying programmes within BGS make it difficult to identify the first field card specific to the precursors of the current G-BASE project; some sampling which contributed to publication of regional geochemical atlases and the preparation of regional geochemical datasets and databases was undertaken under the auspices of uranium exploration by the Atomic Energy Division and later the Radioactive and Rare Minerals Unit (RMMU). The history and format of all geochemical field cards from 1970-1992 is documented in a technical report by Harris et al (1993), which shows that from 1970 onwards, observations have been recorded on a pre-printed A6 size field card in a format which is still broadly followed today by G-BASE with space for a series of coded observations and additional freehand comments at the bottom/overleaf. The back of the G-BASE field cards has remained unprinted so as to allow additional freehand comments.

Harris and Coats (1992) also defined a "Code version" domain table for the Geochemistry Database (BGS_MTA_DOM_CODE_VERSION) , that listed, defined and coded each field card code version up to and including 1992. An updated version of this table is given in Appendix 1:.

All known field cards relating to regional geochemical sampling undertaken for atlas production are currently stored in metal cabinets in room P006/7, in batches of 100, with each atlas area separated and labelled. The oldest cards (identifiable by date) that are stored here were completed in 1970 and are from the Sutherland and Shetland atlas areas.

Until 1983, the data recorded by hand in the field were transferred into digital form via Fortran computer punch cards. The observations recorded on the original field card were organised into a series of sub-cards because for each sample four or five 80 column computer punch cards were required to store the information. The G-BASE card has retained this legacy of organisation into five different printed sub-cards because it allows useful separation into different categories of site and sample observations, and provides a simple numerical reference system for freehand comments.

G-BASE field cards have usually been printed with a title at the top and a label along the base or side which gives some indication of revision date. However, no systematic approach has been used in the labelling and no cross-reference made to an explanation of the observations and codes that have been changed/utilised. As a consequence it is difficult to identify the major changes that have taken place. Dates on cards have, historically, referred to reprints or revisions, and a version number (01) has been used only once in the last 30 years, in 2003. Although a printed version number, in addition to year, has been unnecessary as G-BASE has never in this period undertaken more than one revision of a field card in any given year.

With the publication of this report a systematic approach will be adopted to ensure that different versions of cards can be readily identified. From 2005 the year of revision is printed as a label on the card and guidance overlay and a version number added. To illustrate this, the label on the revised drainage field card for 2005 will read "G-BASE drainage card for 2005 version 2005.2". Until revised, any future reprints will have the same label.

It is important that changes made to the format of the card and the manner of recording observations are documented and can be referred to in future years by anyone wishing to use field observational data. Each revised version should therefore be coded and defined in the BGS_MTA_DOM_CODE_VERSION domain table of the Geochemistry Database; the numeric code can then be entered on the field database for each record, allowing information to be passed to future data users.

The translation and definition details in the domain table include a reference to this report where all changes and guidance for filling-in the 2005 GBASE cards are documented. For versions between 1991 and 2005, this report and other relevant documents are referenced where appropriate in the domain table. The following section briefly describes changes in G-BASE field cards from 1981 onwards and can be considered as an update to Harris et al 1993 who describe in detail the pre1981 versions.

2.2 VERSIONS OF G-BASE CARDS 1981-2004

The usage and revision of G-BASE cards from 1981 to present has been complicated by the collection of additional sample types, especially soils, and different sampling environments as the survey has progressed southwards over Britain, including numerous urban areas. The main changes in usage and revisions of field cards in this period are summarised in Table 2, where the Geochemistry Database code version is also identified. The changes are described in detail below and Geochemistry Database code versions are included in bold to identify each major revision.

Although, as reported in Harris et al, 1993, the same printed drainage field card **(81.1)** was used by G-BASE between 1981 and 1991, an important, undocumented, change took place from 1986 (Tyne-Tees atlas area) when soils were first incorporated as a regional geochemical sample type. The soil sampling procedure at this time consisted of collection of one depth soil from one auger hole in alternate km squares over parts of the atlas areas where drainage density was low.

The fundamentals of the soil sample observations were recorded in a systematic, abbreviated form on the reverse of the drainage card i.e. depth (cm or m), texture, colour and horizon. Texture and colour were identified using the schemes and abbreviations currently in use by G-BASE. Site observations were recorded in the appropriate positions on the front of the drainage card and the soil sample sites identified by the code S in the sample type box.

Cards with different printed date labels were used in 1986, 1987 and 1988 but no change was made to the format of the card. A major revision was undertaken in 1991, with the introduction of the "GSP DRAINAGE/SOIL" card (**91.1**) (GSP - Geochemical Survey Programme, the previous name for the G-BASE project). Dedicated boxes were printed in sub-card 4 for recording soil colour, texture, horizon, depth (m) and clast lithology, for one soil sample per site. Codes used in-field were revised to match newly defined Geochemistry Database domain tables for contamination in card 1. Space for recording stream water pH, conductivity, bicarbonate, and fluoride were removed from card 1, while space for recording water temperature was added to card 3. Catchment litho-age and chrono-age were removed from card 3 and a new field added for site geology to be recorded like catchment geology using the BGS petmin code. The changes to the 1991 card were made with the objective that all observations/recordings could be translated for storage in fields available on the Geochemistry Database with entries that are defined in domain tables.

In 1993 this card was used for the first two urban soil sampling exercises in Wolverhampton and Stoke. At each site two soil samples were collected, a topsoil coded S on the card and a deeper soil coded SD. A differently numbered card (from the G-BASE random number lists) was used for the two samples from each site. Analytical information that Bob Lister holds digitally for these sites has been translated to use the standard G-BASE soil codes of A (topsoil) and S (depth soil) before loading to the Geochemistry Database.

From 1994, the G-BASE regional survey incorporated a more comprehensive soil sampling programme, and at each soil sample site a topsoil sample (A) was collected in addition to the depth sample (S). The "A" sample observations were recorded on the reverse of the card, thereby giving both samples from any site the same number. The 1991 G-BASE card continued to be used like this for G-BASE regional soil and sediment sampling (and the NI drainage surveys of 1994 - 1998) without change until 2003 when a revised drainage-only card was re-introduced and a new regional soil card introduced.

The main changes to the 2003 drainage card (**2003.1**) were: removal of soil data, removal of water temperature, addition of boxes for stream water pH (intended for site measurement), the inclusion of an expanded range of contaminant tick boxes and new methodology for recording site and catchment geology and stream clast lithology. Where previously the BGS Petmin codes or local GBASE abbreviations had been used, the new BGS Rock Classification Scheme (RCS) codes were used for recording site geology, catchment geology and stream clast lithology observations. It is of some concern, however that the RCS allows a much narrower division of rock types than the Petmin code and translations of existing field data held in the Geochemistry Database has reduced the detail that was originally recorded. The 2003 regional drainage card also saw the direct recording of land-use codes in the field using Geochemistry Database alphanumeric codes for the first time.

The new 2003 regional soil card (**2003.2**) provided printed spaces for recording of A & S sample details on the front of the card and introduced recording of slope at site and soil moisture content. Changes to the way site geology, catchment geology, clast lithology and land use were recorded on the drainage card were also incorporated into the soil card. The 2003 cards and guidance overlays are presented and described briefly in the 2004 G-BASE field procedures manual (Johnson, 2004)

Urban soil sampling undertaken as part of G-BASE, saw a number of versions of field cards and field codes used from 1993 onwards. Following the use of the 1991 drainage/soil card (**91.1**) for urban sampling in 1993, the first dedicated urban soil/water card was introduced in 1994 (**94.1**), which was radically different from G-BASE predecessors and was designed by Mick Strutt. All references to sub-card numbers were removed so field data comments could not be clearly referenced. Space was introduced for measurements of soil gases and all observations relating directly to stream sediments or heavy mineral concentrates were removed. Space was only provided for recording details of one soil sample per site and a second card was completed using the same sample number for the second soil sample. Soil sample and geological observations appeared to be made using standard G-BASE codes/abbreviations.

In 1995 a second, revised, version of the urban soil/water card (**95.1**) was used, again providing room to record only one soil sample per card, so two cards, both with the same sample number, were used for each site. Significant changes were made to the way field data was recorded on this card; land use appears to have been recorded directly using Geochemistry Database codes, Soil colour was recorded using Munsell colour codes and soil texture was recorded directly using Geochemistry Database one-character alphabetic codes. A printed space for recording drift was omitted and all bedrock/clast lithologies were recorded using the BGS Petmin code. Printed boxes for recording soil gas measurements were retained.

A version of the urban soil/water card with a printed 1996 date was used for urban soil/water sample collection in 1996 and 1997. The card, or codes used do not appear to have been revised form the 1995 version, with two similarly numbered cards used for recording the A & S samples from any given site. The status or location of digitally stored field data from urban sampling undertaken between 1993 and 1997 is at present unknown.

From 1998 until 2000 GBASE urban field data was recorded using the standard GSP 1991 drainage/soil card (**91.1**), with one card used for describing both samples from each site, and the adoption of standard G-BASE codes and abbreviations. In 2001 a revised G-BASE urban soil card (**2001.1**) was introduced which was used from 2001 to 2004. This card allowed both A and S soil details to be recorded on the front of the card. Other observations were recorded in standard G-BASE format and all reference to drainage samples removed from the printed card.

In preparation for the 2005 field season a major review, revision and rationalisation of the G-BASE field cards and guidance notes has been undertaken and a full guide to their usage prepared (see following section). Two field cards now exist for use, G-BASE regional drainage (**2005.2**) and G-BASE soil (**2005.1**) and are described in detail in the following sections. The soil card is designed for use in both urban and regional environments. New observations include mineralisation style in bedrock (where present), and in the case of soils, the recording of soil moisture and soil organic content for both A and S samples.   Stream water pH and estimation of colloidal component in stream sediment sample have been removed. The guidance overlays have been revised and expanded lists of contaminants, land uses and rock types added, to aid the samplers in data recording. A field procedures protocol code, defined in the Geochemistry Database and cross-referenced to the G-BASE field procedures manual will be added to each record on the database, allowing future data users to identify clearly how the samples were collected and treated in the field.

2.3 FUTURE DEVELOPMENTS

As mentioned at the start of this section, field cards have been in use by geochemical mapping projects for more than 35 years. With the drive to implement more digital data capture in the field the BGS SIGMA project has been working with G-BASE to test out robust hand-held computers for field data entry (Scheib, 2005). The G-BASE project was issued with two SIGMA kits (SIGMA 1 and SIGMA 2) to be tested during the summer field campaign of 2004. The kits included an iPAQ (including a carrying case), Bluetooth GPS and digital camera.

The iPAQ has an Arcpad front end, which mimics the G-BASE soil and drainage field cards. The fields that need to be filled in by the samplers have drop down boxes, much the same as the G-BASE field database. The advantage of using the iPAQs is that field data cannot be omitted, as every field needs to be filled in before the data can be saved. The data can be downloaded to a laptop at the end of the day, saving valuable time typing the data into the MS Access database and avoiding transcription errors when entering the sample locations.

The initial problems in testing the iPAQs were generally due to lack of training. They are to be tested again in 2005, but with sufficient training they could prove to be a valuable addition to the G-BASE sampling equipment. Field cards will continue to be used for the foreseeable future, until the iPAQs prove to be reliable and robust in field conditions.

Year	Title of card	Label on card	GD code	Comments and usage
1981	DRAINAGE	APPLIED GEOCHEMISTRY GROUP – INSTITUTE OF GEOLOGICAL SCIENCES 1981	**81.1**	From 1986 also used for soils although only specifically designed and printed for drainage on front; soil texture, colour, depth details given on reverse in standardised form. Depth soils (S) only collected. Used until 1991
1987	DRAINAGE	BGS 1987	**81.1**	Used for regional drainage and soils although only specifically designed & printed for drainage on front; soil texture, colour, depth details given on reverse in standardised form. Depth soils (S) only collected. Printed format not revised from above.
1988	DRAINAGE	APPLIED GEOCHEMISTRY GROUP – BRITISH GEOLOGICAL SURVEY 1988	**81.1**	Used for regional drainage and soils although only specifically designed and printed for drainage on front; soil texture, colour, depth details given on reverse in standardised form. Depth soils (S) only collected. Printed format not revised from above.
1991	GSP DRAINAGE/SOIL	APPLIED GEOCHEMISTRY GROUP BRITISH GEOLOGICAL SURVEY 1991	**91.1**	Significantly revised from above. First regional card to incorporate printed spaces for soil codes on front of card. Space only available for one soil sample (S). From 1994 when topsoils (sample type =A) collected the A details put on back in same standardised format. In 1993 used for urban sampling in Wolverhampton and Stoke when a separately numbered card was used for topsoils (sample type = S) and depth soils (sample type = SD) from same site. These sample types were non-standard and have never been used on field cards since. They have been translated to A & S on files held by Bob Lister. In 1998-2000 this card was used for urban soil sampling but in standard G-BASE style with A sample observations on back of card.
1994	URBAN SOIL/WATER	APPLIED GEOCHEMISTRY GROUP, BRITISH GEOLOGICAL SURVEY, 1994	**94.1**	First urban-only sampling card. Radically different from regional predecessors. No space for drift observations but soil gases Radon, CO2, methane included. Separate card filled for topsoil (A) and depth soil (S) but with same number. Uses standard G-BASE coded observations for soils.
1995	URBAN SOIL/WATER	M.H.Strutt, APPLIED GEOCHEMISTRY GROUP, BRITISH GEOLOGICAL SURVEY, 1995	**95.1**	Separate card filled for topsoil (A) & depth soil (S) but with same number. Uses different codes to standard GBASE for soil observations and possibly different sampling protocol.
1996	URBAN SOIL/WATER	M.H.Strutt, APPLIED GEOCHEMISTRY GROUP, BRITISH GEOLOGICAL SURVEY, 1996	**95.1**	Apparently identical to previous year's card. Used in 1996 and 1997.
2001	GBASE URBAN SOIL		**2001.1**	Revised urban soil card used 2001-2004. Uses standard G-BASE observational codes for data recording. Has pre-printed facility for A & S sample observations on front of card. Uses full GD codes for land use for first time, otherwise site observations are made using standard G-BASE field card codes.
2003	G-BASE REGIONAL DRAINAGE	G-BASE STREAM SEDIMENT FIELD CARD VERSION 01, MAY 2003	**2003.1**	Revised drainage-only card. Soil data removed, water temp removed, pH added. Expanded range of contamination tick-boxes. Site geology, catchment geology, stream clast lithilogy entered using BGS Rock Classification Scheme (RCS). Land use entered using GD codes from BGS.MTA_DOM_LANDUSE
2003	G-BASE REGIONAL SOIL	G-BASE SOIL FIELD CARD VERSION 01, MAY 2003	**2003.2**	New regional-only soil card.
2005	GBASE soil	2005 G-BASE URBAN/REGIONAL SOIL	**2005.1**	Combines urban and regional soil observations. Few new fields added and enhanced list of codes for rock names using Rock Classification Scheme, minerals. field procedures protocol and field card code version added to field database for each record. Card described in detail in this report
2005	GBASE regional drainage	2005 G-BASE REGIONAL DRAINAGE	**2005.2**	Revised regional drainage card. Enhanced list of codes for rock names using Rock Classification Scheme, minerals. Field procedures protocol and field card code version added to field database for each record. Card described in detail in this report

Table 2: Summary of G-BASE field cards 1981-2005

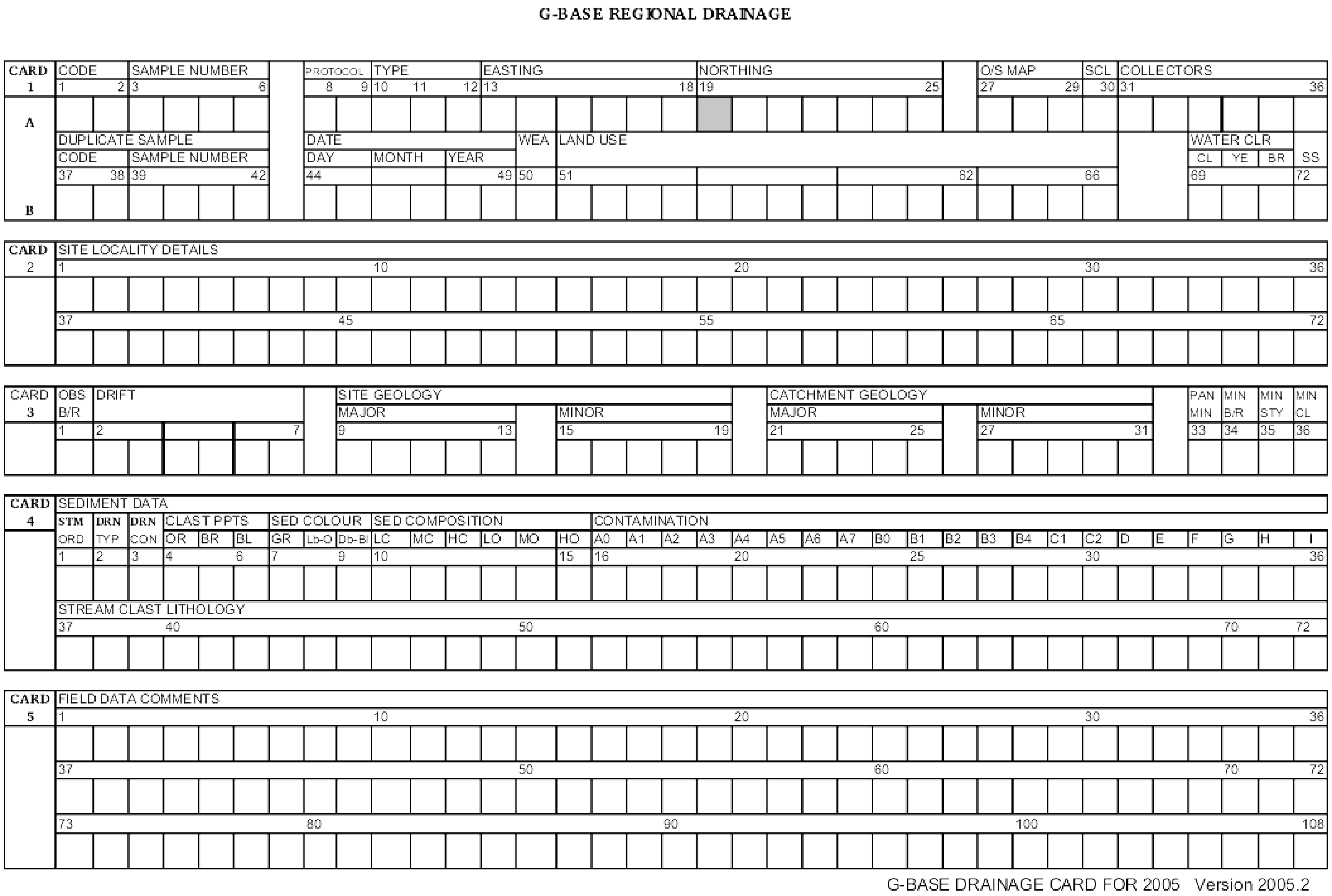
2.4 CURRENT FIELD CARD

2.4.1 Drainage site

The current drainage site field card is shown in Figure 1 along with the field codes to be used (Figure 2 and Figure 3). Instructions for filling each field are given in Table 3.

2.4.2 Soil site

The current field card for soil sites is shown in Figure 4 along with the field codes to be used (Figure 5 and Figure 6). Instructions for filling each field are given in Table 4.



G-BASE REGIONAL DRAINAGE

CARD 1 | CODE 1 2 | SAMPLE NUMBER 3 6 | PROTOCOL 8 9 | TYPE 10 11 12 | EASTING 13 18 | NORTHING 19 25 | O/S MAP 27 29 | SCL 30 | COLLECTORS 31 36

A

DUPLICATE SAMPLE: CODE 37 38 | SAMPLE NUMBER 39 42 | DATE: DAY 44 | MONTH | YEAR 49 | WEA 50 | LAND USE 51 62 66 | WATER CLR: CL YE BR 69 | SS 72

B

CARD 2 | SITE LOCALITY DETAILS 1 10 20 30 36 | 37 45 55 65 72

CARD 3 | OBS B/R 1 | DRIFT 2 7 | SITE GEOLOGY: MAJOR 9 13 | MINOR 15 19 | CATCHMENT GEOLOGY: MAJOR 21 25 | MINOR 27 31 | PAN MIN 33 | MIN B/R 34 | MIN STY 35 | MIN CL 36

CARD 4 | SEDIMENT DATA | STM ORD 1 | DRN TYP 2 | DRN CON 3 | CLAST PPTS: OR BR BL 4 6 | SED COLOUR: GR Lb-O Db-Bl 7 9 | SED COMPOSITION: LC MC HC LO MO HO 10 15 | CONTAMINATION: A0 A1 A2 A3 A4 A5 A6 A7 B0 B1 B2 B3 B4 C1 C2 D E F G H I 16 20 25 30 36

STREAM CLAST LITHOLOGY 37 40 50 60 70 72

CARD 5 | FIELD DATA COMMENTS 1 10 20 30 36 | 37 50 60 70 72 | 73 80 90 100 108

G-BASE DRAINAGE CARD FOR 2005 Version 2005.2

Figure 1: Drainage site card (2005.2)

G-Base Regional drainage field card guidance overlay for card version 2005.2

SAMPLE TYPE (110-112)
C Stream sediment
P Panned Concentrate
W Water

EASTING (113-118) GPS reading
NORTHING (119-125) GPS reading

OS MAP NUMBER (127-129)
Printed number on cover of field map
MAP SCALE (130)
1 1:50,000 (1:50K)
2 1:25,000 (1:25K)
3 1:10,000 (1:10K)

COLLECTORS (131-136)
Collectors initials, person filling in card first. Max 3 characters each

PROTOCOL (108-109)
Fieldwork protocol number that applies to field season

WEATHER (150)
2 rain heavy within 12 hours
4 rain heavy within 24 hours
6 rain heavy within 48 hours
7 rain heavy 2-7 days
8 no rain within a week

LAND USE (151-166)
AEBB Mature Coniferous Forest
AEBA Recent Coniferous Forest
AEAB Mature Deciduous Forest
AEAA Recent Deciduous Forest
AC00 Rough Grazing
ABB0 Heather Moor
BD00 Arable
BAB0 Pasture
C000 Port areas and airfields
DD00 Recreational
DAC0 Urban Open Space
E000 Industrial
EAC0 Metal Manufacture
EB00 Extractive

WATER COLOUR (169-171)
CL Clear
YE Yellow
BR Brown

SUSPENDED SOLIDS (172)
1 Light
2 Moderate
3 Abundant

OBSERVED BEDROCK (301)
Within 100m of site
0 No outcrop
1 Minor outcrop
2 Moderate outcrop
3 Abundant outcrop

DRIFT (302-307)
Drift types at site and in adjacent and upstream areas

A1 Blown Sands
A4 Raised Beach
A5 Estuarine
B2 Alluvium
B3 Coarse Gravel
C1 Soil
C2 Marsh
C3 Peat Bog
D1 Clay with Flints
D3 Scree
E0 Glacial
E1 Till
E2 Moraine
E3 Fluvioglacial
F0 Made ground

SITE GEOLOGY (309-319)
Enter in order of decreasing abundance using RCS codes overleaf.

CATCHMENT GEOLOGY (321-331)
Enter in order of decreasing abundance using RCS codes overleaf

PAN MINERALS (333)
Enter 1 if minerals of interest present. List minerals and describe abundance, form, weathering etc in field data comments.

MINERALISED BEDROCK (334)
Enter 1 if minerals of interest present. List minerals and describe abundance, weathering etc in field data comments.

MINERALISATION STYLE IN BEDROCK (335)
1 Vein
2 Fault
3 Pod
4 Lens
5 Stratiform
6 Joint or fracture
7 Disseminated
9 Staining or coating

MINERALISED CLASTS (336)
Enter 1 if minerals of interest present in clasts. List minerals and describe abundance, style, weathering etc in field data comments.

DRAINAGE TYPE (402)
1 Seepage or spring
2 Ditch
3 Drains, land drains
4 Small stream <3m wide
5 Stream 3-10m wide
6 Small river 10-33m wide

DRAINAGE CONDITION (403)
1 Dry
2 Ponded with dry sections
3 Low flow
4 Moderate flow-only boulders visible
5 Strong flow-large boulders visible
6 Channel filled bank to bank
7 Overflow –banks burst
8 Spate

Figure 2: Page one of drainage site coding information

G-Base Regional drainage field card guidance overlay for card version 2005.2

CLAST PRECIPITATES (404-406)

COLOUR	ABUNDANCE
OR Orange	1 light
BR Brown	2 Moderate
BL Black	3 Heavy

SEDIMENT COLOUR (407-409)

GR	Grey
LB-O	Light Brown-orange
DB-BL	Dark brown-black

SEDIMENT COMPOSITION (410-415)

LC	Low clay
MC	Moderate clay
HC	High clay
LO	Low organics
MO	Moderate organics
HO	High organics

SITE CONTAMINATION (416-436)

A0	Manufactured Metal	E0	Rubber
A1	Iron, steel wire	F0	Chemical
A2	Galvanized iron	F1	Paint
A3	Copper		
A4	Lead	G0	Liquid effluent
A5	Zinc	G1	Farm effluent
A6	Brass	G2	Domestic effluent
A7	Aluminium	G3	Industrial effluent
B0	Ceramic	H0	Bulk industrial waste
B1	Pottery	H1	Metal mine tailings
B2	Tiles	H2	Coal tailings
B3	Bricks	H3	China clay tailings
B4	Glazed China	H4	Slag (furnace waste)
C0	Glass	I0	Agro-chemicals
C1	Clear glass	I1	Fertilizer
C2	Coloured glass	I2	Lime
D0	Plastic		
D1	Fertilizer sack		

MINERAL ABBREVIATIONS
(For use in description of pan minerals, clast mineralisation and bedrock mineralisation.)

AsFeS	Arsenopyrite	Mon	Monazite
Ba	Baryte	FeS	Pyrite
Born	Bornite	Pyrr	Pyrrhotite
Cal	Calcite	Qtz	Quartz
Cass	Cassiterite	AsS	Realgar
CuFeS	Chalcopyrite	Tiox	Rutile
Cr	Chromite	Schee	Scheelite
HgS	Cinnabar	ZnS	Sphalerite
Epi	Epidote	SbS	Stibnite
Fluor	Fluorite	Tour	Tourmaline
PbS	Galena	Wolf	Wolfram
Gt	Garnet	Zr	Zircon
Au	Gold	Coal	Coal
Hem	Hematite		
Ilm	Ilmenite		
Mag	Magnetite		
MoS	Molybdenite		

ROCK CLASSIFICATION SCHEME (RCS) For use in recording SITE GEOLOGY, CATCHMENT GEOLOGY and CLAST LITHOLOGY

IGRU	Igneous rock	BA	Basalt	SR	Sedimentary rock	CHLK	Chalk	METR	Metamorphic
DOLR	Dolerite	GB	Gabbro	CONG	Conglomerate	LMST	Limestone	QZITE	Quartzite
LMPY	Lamprophyre	MR	Mafic Rock	SDST	Sandstone	DLSD	Dolomite seds	PSAMM	Psammite
PGGN	Pegmatite (granite)	DUN	Dunite	FAREN	Feldspathic arenite	FEST	Ironstone	PEL	Pelite
PPHY	Porphyry	PDT	Peridotite	SLST	Siltstone	AGATE	Agate	PEPH	Pelite (Phyllitic)
FELS	Felsite	SEPITE	Serpentinite	MDST	Mudstone	CHRT	Chert	SLTE	Slate
GN	Granite	AGG	Agglomerate	OILS	Oil shale	FLNT	Flint	MARBLE	Marble
GD	Granodiorite	TUFF	Tuff	CLAY	Clay	GYPS	Gypsum		
DI	Diorite	ASH	Ash (tephra)	CALSST	Marl	ANHY	Anhydrite		
RY	Rhyolite					COAL	Coal	SCH	Schist
AND	Andesite					CMDST	Carbonaceous mudstone	GNSS	Gneiss
DA	Dacite							MYL	Mylonite

Figure 3: Page two of drainage site coding information

Table 3: Table summarising instructions for completing a drainage site field card (for card version 2005.2)

Card No.	Box No	Detail of Entry
1	01-06	Sample Number, comprising 2 figure numeric Atlas Code and 4 figure sample number. Should always be pre-numbered and therefore not entered at site.
1	08-09	Field Procedures protocol, a two digit code specify the fieldwork protocols being used
1	10-12	Sample Types collected at site. Entered at site using appropriate single-digit alphabetic codes as per guidance overlay.
1	13-18	Easting. Exact 6 figure British National Grid (BNG) easting of drainage sample collection location transcribed at site from GPS reading.
1	19-25	Northing. Exact 6/7 figure (BNG) northing of drainage sample collection location transcribed at site from GPS reading. Normally in UK, excepting Orkney and Shetland, box 19 represents a leading 0 which need not be recorded at site and which is not be displayed by GPS.
	27-29	OS Map Number. Entered at site using the OS published map number on the field map.
1	30	Map Scale. Scale of OS map used in field, entered at site using a code as per guidance overlay
1	31-36	Collectors. The initials of samplers, entered at site, using 2 or 3 characters each as appropriate. Boxes 31-33 should always give the initials of the sampler who is filling-in the field card while boxes 34-36 give the initials of the sampler undertaking the sieving and panning.
1	37-42	Duplicate Sample Number. Will appear pre-numbered at one site in every 100 and indicates that the samplers should collect a duplicate field sample. The number will be different to that in boxes 1-6, but will be constructed in a similar way with a two digit atlas code and a 4 digit sample number. A second field card will have been issued, next in sequence, with the duplicate sample number in boxes 01-06. This card should be used to make detailed sample and site observations specifically relating to the second or duplicate sample.
1	44-49	Date. Entered at site in DDMMYY format.
1	50	Weather. Entered at site using codes as per guidance overlay to give an indication of recent rainfall pattern.
1	51-66	Land Use. Entered at site using 4 digit alphanumeric codes as per guidance overlay. Boxes 51-66 allow for entry of 4 codes representing different land uses adjacent to and upstream of site, up to a distance of approximately 300m from the site. They should be entered in order of prominence. Any additional land-uses should be recorded in card 5, Field Data Comments.
1	69-71	Water Colour. Entered at site after brief visual examination of a sample of stream water held up to light in clean, clear plastic bag. The water colour should normally be categorised as “clear” (box 69), “yellow” (box 70) or “brown” (box 71), with a “1” entered in the appropriate box. Any exceptional water colours should be recorded in card 5, Field Data Comments.
1	72	Suspended Solids. Entered at site, using 1-digit code as per guidance overlay, after brief visual examination of a sample of stream water held up to light in clean, clear plastic bag.

Card No	Box No	Detail of Entry
2	01-72	Site Locality details. Entered at site to give a clear written description of the sample site location. Should enable the site to be readily relocated on foot using only map and compass, without the aid of a GPS. The stream should firstly be identified using it's name (as on field map) where possible or in relation to a fixed feature on the ground that is marked or named on map. Secondly the distance upstream or downstream of a fixed feature readily identifiable on map and ground, and which the stream intercepts, should be given. E.g. Bob's Burn, 80m upstream of B140. In relatively featureless terrain, or ambiguous locations a compass bearing from a fixed point readily identifiable on map and ground should be given, and the stream order & direction of stream flow included. e.g. 2^{nd} S draining 1st order stream W of Johnson's Hill, 60m upstrm confl 2^{nd} E bank trib, 800m/077° from Brown's Hall Farm. Tributaries are always counted in downstream direction, the headwater confluence being the first. Clear standardised abbreviations should be used. Any overspill from boxes 01-72 should be entered in card 5 or on the reverse of the field card as necessary.
Card No	Box No	Detail of Entry
3	01	Observed Bedrock. Entered at site using 1 digit code as per guidance overlay, after site inspection to give indication of abundance of outcrop within 100m of site.
3	02-07	Drift Type. Entered at site using 2 digit alphanumeric codes as per guidance overlay, after inspection of site and upstream area, up to a distance of approximately 300m from the site. Information taken from geological map may be used on return to field base to confirm descriptions. The order of observations is in order of prominence. Any further observations should recorded in card 5, Field Data Comments.
3	09-13 15-19	Site Geology. **Entered at site if outcrop is present within 100m** (i.e. if box 301 <> 1) based on visual inspection and using Rock Classification Scheme codes as per guidance overlay. The dominant lithology should be recorded first and, thereafter, in order of decreasing abundance. Overspill should be should recorded in card 5, Field Data Comments. Samplers should be encouraged to make further geological observations of outcrop that may influence geochemistry eg colour, minerals present etc in card 5.
3	21-25 27-31	Catchment Geology. Entered at site (if possible) after noting outcrop in upstream area, (*normally up to 2 km,*) using Rock Classification Scheme codes as per guidance overlay. Information taken from geological map may be added on return to field base. The dominant lithology in the catchment should be recorded first and thereafter in order of decreasing abundance. Overspill should be should recorded in card 5, Field Data Comments.
3	33	Pan Minerals. Entered at site after careful visual inspection (eye and hand lens) of final volume panned concentrate sample, using a "1" to indicate that heavy minerals of economic or geological interest are present. Left blank if none present. Where this box is filled the sampler must then give details of the minerals present in the Field Data Comments using mineral name abbreviations as per guidance overlay, and an indication of abundance, grain size, form and weathering state where possible. e.g 3 coarse rounded grains Au (1pprox 1mm), mod coarse fresh FeS, 2 grains weathered PbS (0.5mm), trace fine Zr.
3	34	Mineralised Bedrock. Entered at site after careful visual inspection (and use of hammer) of outcrop within 100m, using a "1" to indicate that minerals of economic or geological interest is present. Left blank if none present. If this box is filled then the following box, 335-mineralisation style, must be filled and details given in field data comments, noting minerals present, abundance etc., as above. Mineralised bedrock observed between sites, but not within 100m should be described in Field data comments, noting the location relative to site. Such occurrences may be relative to more than 1 site.
3	35	Mineralisation Style. Entered at site after careful visual inspection (and use of hammer) of outcrop within 100m, using a 1 digit code as per guidance overlay to indicate style.
3	36	Mineralised Clasts. Entered at site after careful visual inspection (and use of hammer) of clasts at site and in area directly up and downstream, using a "1" to indicate that mineralisation of economic or geological interest is present. Left blank if none present. Where this box is filled the sampler must give details in

		Field Data comments, indicating minerals present, style of mineralisation and abundance. Eg 1 large qtz clast containing 2mm thick vein Pbs or numerous shale clasts containing disseminated Fes.
Card No	**Box No**	**Detail of Entry**
4	01	Stream Order. Entered on site using combination of map and in-field observation. 1 digit reflecting Strahler's system of stream order classification (see Figure 7)
4	02	Drainage Type. Entered at site, after inspection, using one digit numeric code as per guidance overlay.
4	03	Drainage Condition. Entered at site, after inspection, using one digit numeric code as per guidance overlay.
4	04-06	Clast Precipitates. Entered at site, after careful examination of clasts. Box 04 represents orange coatings, box 05 represents brown and box 06 represents black. In each box a 1-digit code of 1,2 or 3(as per guidance overlay) should be entered where appropriate. Where clast precipitate coatings are absent the box(es) should be left blank. One, two or all three boxes may contain entries, or all may be left blank if appropriate.
4	07-09	Sediment Colour. Entered at site after visual examination of homogenized –150 µm sediment prior to bagging-up. Sediment colour should normally be categorised as "grey" (box 07), "light brown-orange" (box 08) or "dark brown-black" (box 09), with a "1" entered in the appropriate box. Any exceptional sediment colours should be recorded in card 5, Field Data Comments. See guidance overlay for clarification of abbreviations printed over top of each box.
4	10-15	Sediment Composition. Entered at site based on visual inspection of stream sediment during digging, sieving and homogenisation. Boxes 10-12 represent low, medium or high clay, respectively and the appropriate box should be marked with "1". Boxes 10-12 represent low, medium or high organics, respectively and the appropriate box should be marked with "1". See guidance overlay for clarification of abbreviations printed over top of each box.
4	16-36	Site Contamination. Entered at site based on visual inspection of site and upstream area of at least 100m. Should also include any contamination encountered during digging, sieving or in heavy mineral concentrate. Each box represents a different category of contamination which should be marked with "1" if observed. Numerous boxes may be filled at each site. An individual manufactured item that is present may comprise different categories of contaminant type, all of which should be noted. See guidance overlay for clarification of contamination code printed over top of each box. Further details of each contaminant should be given in card 5, Field Data Comments, including, location, size and abundance of each contaminant. Eg two car batteries 40m upstream, 3 grains lead shot in pan.
4	37-72	Stream Clast Lithology. Entered at site after careful visual observation at site, upstream of site and during digging and sieving. Use abbreviated rock type names from Rock Classification Scheme as per guidance overlay. Rock types should be entered in order of decreasing abundance. A space should be left between each entry. Any overspill or further description should be entered in card 5, Field Data Comments.
Card No	**Box No**	**Detail of Entry**
5	01 onwards inc. back of field card	Field Data Comments. Entered at site. Card 5 allows samplers to add further information relating to coded observations in cards 1-4. Where contamination and pan, clast, bedrock minerals are observed further details must be given here. To allow unambiguous digital data entry, each observation should be preceded by the numeric identification of the coded observation to which it relates. e.g.331 2 rounded grains Au, Indicates that the observation relates to Card 3, box 31 (pan minerals). Often the comments will exceed the space available in card 5 and are necessarily continued on the unprinted back of the card.

CARD 1	CODE		SAMPLE NUMBER			PROTOCOL		TYPE		EASTING		NORTHING			O/S MAP		SCL	COLLECTORS	
	1	2	3	6		8	9	10	11	12	17	18	24		26	28	29	30	35
A																			
	DUPLICATE SAMPLE					DATE				WEA	LAND USE				DRIFT				SLP
	CODE		SAMPLE NUMBER			DAY	MONTH	YEAR											
	36	37	38	41		43			48	49	50		61		62		67		70
B																			

CARD 2	SITE LOCALITY DETAILS				
	1	10	20	30	35
	36	45	55	65	70

CARD 3	OBS B/R	MIN B/R	MIN STY	MIN CL	MAPPED SITE GEOLOGY MAJOR		MINOR		CONTAMINATION A0	A1	A2	A3	A4	A5	A6	A7	B0	B1	B2	B3	B4	C1	C2	D	E	F	G	H	I
	1	2	3	4	5	9	10	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

CARD 4	SOIL DATA														
	DEPTH		COLOUR		TEXTURE		H2O	ORG	SOIL CLAST LITHOLOGY						
	1	3	4	5	6	9	10	11	13	15	20	25	30	35	
A															
	DEPTH		COLOUR		TEXTURE		H2O	ORG	SOIL CLAST LITHOLOGY						
	36	38	39	40	41	44	45	46	48	50	55	60	65	70	
S															

CARD 5	**FIELD DATA COMMENTS**				
	1	**10**	**20**	**30**	**35**
	41	**50**	**60**	**70**	**70**

G-BASE SOIL CARD FOR 2005 Version 2005.1

Figure 4: Soil site card (2005.1)

G-BASE soil field card guidance overlay for card version 2005.1

SAMPLE TYPE (110-111)

A	Surface Soil
S	Profile soil

COLLECTORS (130-135)
Collectors initials, person filling in card first. Max 3 characters each

WEATHER (149)

2	rain heavy within 12 hours
4	rain heavy within 24 hours
6	rain heavy within 48 hours
7	rain heavy 2-7 days
8	no rain within a week

EASTING (112-117) GPS reading
NORTHING (119-124) GPS reading

LAND USE (150-161)

AEBB	Mature Coniferous Forest	EAD0	Engineering, manufacturing, shipbuilding
AEBA	Recent Coniferous Forest	EAE0	Vehicle manufacture
AEAB	Mature Deciduous Forest	EAF0	Metal goods manufacture (not specified elsewhere)
AEAA	Recent Deciduous Forest	EAG0	Precision instruments manufacture, jewellery
AC00	Rough Grazing	EAH0	Textile manufacture
ABB0	Heather Moor	EAI0	Leather manufacture, leather goods, fur
BD00	Arable	EAJ0	Clothing manufacture
BAB0	Pasture	EAK0	Food manufacture, drink, tobacco
C000	Port areas and airfields	EAL0	Wood manufacture and cork
CB00	Major roads	EAM0	Paper manufacturing industries
CD00	Railways	EAN0	Other manufacturing industries
DD00	Recreational	EB00	Extractive
DAC0	Urban Open Space	EBA0	Quarry, mine (non metalliferous, non coal)
DACA	Urban open space tended but unproductive	EBB0	Quarry, mine, coal, lignite
DACB	Urban open space cleared, derelict	EBC0	Quarry, mine, metalliferous
DAA0	Commercial and residential	EC00	Tips
DC00	Caravan/Camp site	ECA0	Domestic urban wastes
E000	Industrial	ECB0	Industrial waste tip
EA00	Manufacturing	ED00	Utilities
EAA0	Treatment of non metalliferous mining products other than coal	EDA0	Water treatment works
		EDB0	Gas works
EAB0	Chemical and allied trades	EDC0	Electrical generation plant
EAC0	Metal Manufacture		

A SOIL TEXTURE (406 – 409)
S SOIL TEXTURE (441 – 444)

SAND	Sand
SILT	Silt
CLAY	Clay
SACL	Sandy clay
CLSA	Clayey sand
SICL	Silty clay
SASI	Sandy silt
SISA	Silty sand

A SOIL COLOUR (404 – 405)
S SOIL COLOUR (439 – 440)

BL	Black
DB	Dark brown
LB	Light brown
RE	Red
OR	Orange
YE	Yellow
GR	Green
GY	Grey

OS MAP NUMBER (126-128)
Printed number on cover of field map
MAP SCALE (129)

1	1:50,000 (1: 50K)
2	1:20,000 (1: 25K)
3	1:10,000 (1: 10K)

PROTOCOL (108-109)
Fieldwork protocol number that applies to field season

MINERALISED CLASTS (304)
Enter 1 if minerals of interest present in clasts. List minerals and describe abundance, style, weathering etc in field data comments.

MINERALISED BEDROCK (302)
Enter 1 if minerals of interest present. List minerals and describe abundance, weathering etc in field data comments.

OBSERVED BEDROCK (301)
Within 100m of site

0	No outcrop
1	Minor outcrop
2	Moderate outcrop
3	Abundant outcrop

A SOIL DEPTH (401 – 403)
Depth to base of surface soil sample in metres

S SOIL DEPTH (436 – 438)
Depth to base of profile soil sample in metres

MAPPED SITE GEOLOGY (305-314)
Enter in order of decreasing abundance using RCS codes overleaf.

MINERALISATION STYLE IN BEDROCK (303)

1	Vein
2	Fault
3	Pod
4	Lens
5	Stratiform
6	Joint or fracture
7	Disseminated
9	Staining or coating

SLOPE (170)

1	Hill top
2	Gentle slope (5 - 20°)
3	Steep slope (>20°)
4	Foot slope base of valley side
5	Valley floor
6	Hollows with marsh or bog
7	Level field, flood plain

A SOIL MOISTURE CONTENT (410)
S SOIL MOISTURE CONTENT (445)

1	Dry
2	Damp
3	Waterlogged

A SOIL ORGANIC CONTENT (411)
S SOIL ORGANIC CONTENT (446)

1	Low
2	Moderate
3	High

Figure 5: Page one of soil site coding information

G-BASE soil field card guidance overlay for card version 2005.1

DRIFT (162-167)
Drift types at site and in adjacent and upstream areas

A1	Blown Sands
A4	Raised Beach
A5	Estuarine
B2	Alluvium
B3	Coarse Gravel
C1	Soil
C2	Marsh
C3	Peat Bog
D1	Clay with Flints
D3	Scree
E0	Glacial
E1	Till
E2	Moraine
E3	Fluvioglacial
F0	Made ground

SITE CONTAMINATION (315-335)

A0	Manufactured Metal	E0	Rubber
A1	Iron, steel wire	F0	Chemical
A2	Galvanized iron	F1	Paint
A3	Copper		
A4	Lead	G0	Liquid effluent
A5	Zinc	G1	Farm effluent
A6	Brass	G2	Domestic effluent
A7	Aluminium	G3	Industrial effluent
B0	Ceramic	H0	Bulk industrial waste
B1	Pottery	H1	Metal mine tailings
B2	Tiles	H2	Coal tailings
B3	Bricks	H3	China clay tailings
B4	Glazed China	H4	Slag (furnace waste)
C0	Glass	I0	Agro-chemicals
C1	Clear glass	I1	Fertilizer
C2	Coloured glass	I2	Lime
D0	Plastic		
D1	Fertilizer sack		

MINERAL ABBREVIATIONS
(For use in description of pan minerals, clast mineralisation and bedrock mineralisation.)

AsFeS	Arsenopyrite	Mon	Monazite
Ba	Baryte	FeS	Pyrite
Born	Bornite	Pyrr	Pyrrhotite
Cal	Calcite	Qtz	Quartz
Cass	Cassiterite	AsS	Realgar
CuFeS	Chalcopyrite	Tiox	Rutile
Cr	Chromite	Schee	Scheelite
HgS	Cinnabar	ZnS	Sphalerite
Epi	Epidote	SbS	Stibnite
Fluor	Fluorite	Tour	Tourmaline
PbS	Galena	Wolf	Wolfram
Gt	Garnet	Zr	Zircon
Au	Gold	Coal	Coal
Hem	Hematite		
Ilm	Ilmenite		
Mag	Magnetite		
MoS	Molybdenite		

ROCK CLASSIFICATION SCHEME (RCS) For use in recording MAPPED SITE GEOLOGY and A & S SOIL CLAST LITHOLOGY

IGRU	Igneous rock	BA	Basalt	SR	Sedimentary rock	CHLK	Chalk	METR	Metamorphic
DOLR	Dolerite	GB	Gabbro	CONG	Conglomerate	LMST	Limestone	QZITE	Quartzite
LMPY	Lamprophyre	MR	Mafic Rock	SDST	Sandstone	DLSD	Dolomite seds	PSAMM	Psammite
PGGN	Pegmatite (granite)	DUN	Dunite	FAREN	Feldspathic arenite	FEST	Ironstone	PEL	Pelite
PPHY	Porphyry	PDT	Peridotite	SLST	Siltstone	AGATE	Agate	PEPH	Pelite (Phyllitic)
FELS	Felsite	SEPITE	Serpentinite	MDST	Mudstone	CHRT	Chert	SLTE	Slate
GN	Granite	AGG	Agglomerate	OILS	Oil shale	FLNT	Flint	MARBLE	Marble
GD	Granodiorite	TUFF	Tuff	CLAY	Clay	GYPS	Gypsum		
DI	Diorite	ASH	Ash (tephra)	CALSST	Marl	ANHY	Anhydrite		
RY	Rhyolite					COAL	Coal	SCH	Schist
AND	Andesite					CMDST	Carbonaceous mudstone	GNSS	Gneiss
DA	Dacite							MYL	Mylonite

Figure 6: Page two of soil site coding information

Table 4: Table summarising instructions for completing a soil site field card (for card version 2005.1)

Card No	Box No	Detail of Entry
1	01-06	Sample Number, comprising 2 figure numeric Atlas Code and 4 figure sample number. Should always be pre-numbered and therefore not entered at site.
1	08-09	Field Procedures protocol, a two digit code specify the fieldwork protocols being used
1	10-11	Sample Types collected at site. Entered at site using appropriate single-digit alphabetic codes as per guidance overlay.
1	12-17	Easting. Exact 6 figure British National Grid (BNG) easting of drainage sample collection location transcribed at site from GPS reading.
1	18-24	Northing. Exact 6/7 figure (BNG) northing of drainage sample collection location transcribed at site from GPS reading. Normally in UK, excepting Orkney and Shetland, box 18 represents a leading 0 which need not be recorded at site and which is not be displayed by GPS.
1	26-28	OS Map Number. Entered at site using the OS published map number on the field map.
1	29	Map Scale. Scale of OS map used in field, entered at site using a code as per guidance overlay.
1	30-35	Collectors. The initials of samplers, entered at site, using 2 or 3 characters each as appropriate. Boxes 31-33 should always give the initials of the sampler who is filling-in the field card while boxes 34-36 give the initials of the sampler undertaking the augering.
1	36-41	Duplicate Sample Number. Will appear pre-numbered at one site in every 100 (1 in 50 for urban areas) and indicates that the samplers should collect a duplicate field sample. The number will be different to that in boxes 1-6, but will be constructed in a similar way with a two digit atlas code and a 4 digit sample number. A second field card will have been issued, next in sequence, with the duplicate sample number in boxes 01-06. This card should be used to make detailed sample and site observations specifically relating to the second or duplicate sample.
1	43-48	Date. Entered at site in DDMMYY format.
1	49	Weather. Entered at site using codes as per guidance overlay to give an indication of recent rainfall pattern.
1	50-61	Land Use. Entered at site using 4 digit alphanumeric codes as per guidance overlay. Boxes 50-61 allow for entry of 4 codes representing different land uses, up to a distance of approximately 300m from the site. They should be entered in order of prominence. Any additional land-uses should be recorded in card 5, Field Data Comments.
1	62-67	Drift Type. Entered at site using 2 digit alphanumeric codes as per guidance overlay, after inspection of site and adjacent area up to a distance of approximately 300m from the site. Information taken from geological map may be used on return to field base to confirm descriptions. The order of observations is in order of prominence. Any further observations should recorded in card 5, Field Data Comments.
1	70	Slope at sample site. Entered at site using 1-digit code as per guidance overlay.
Card No	**Box No**	**Detail of Entry**
2	01-70	Site Locality Details. Entered at site to give a clear written description of the sample site location which should enable the site to be readily relocated on foot using only map and compass, without the aid of a GPS. Use 2 compass bearings (and distances) from fixed features readily identifiable on the ground and on the map. e.g 300m/077° from Brown's Hall Farm 460m/154° from Great Breward church. The two compass bearings should be approximately

		perpendicular. Clear standardised abbreviations should be used. Any overspill from boxes 01-72 should be entered in card 5 or on the reverse of the field card as necessary.
Card No	**Box No**	**Detail of Entry**
3	01	Observed Bedrock. Entered at site using 1 digit code as per guidance overlay, after site inspection to give indication of abundance of outcrop within 100m of site.
3	02	Mineralised Bedrock. Entered at site after careful visual inspection (and use of hammer) of outcrop within 100m, using a “1” to indicate that minerals of economic or geological interest are present. Left blank if none present. If this box is filled then the following box, 303 -mineralisation style, must be filled and details given in field data comments, noting minerals present, abundance etc., as above. Mineralised bedrock observed between sites, but not within 100m should be described in Field data comments, noting the location relative to site. Such occurrences may relate to more than 1 site.
3	03	Mineralisation Style. Entered at site after careful visual inspection (and use of hammer) of outcrop within 100m, using a 1 digit code as per guidance overlay to indicate style.
3	04	Mineralised Clasts. Entered at site after careful visual inspection (and use of hammer) of clasts at site and in adjacent area, using a “1” to indicate that mineralisation of economic or geological interest is present. Left blank if none present. Where this box is filled the sampler must give details in Field Data comments, indicating minerals present, style of mineralisation and abundance. e.g. 1 large qtz clast containing 2mm thick vein PbS or numerous shale clasts containing disseminated FeS.
3	05-14	Mapped Site Geology. Entered from geological map using Rock Classification Scheme codes as per guidance overlay. Entered at site if outcrop is present within 100m (see box 3/01). The dominant lithology should be recorded first and, thereafter, in order of decreasing abundance. Overspill should be should recorded in card 5, Field Data Comments. Samplers should be encouraged to make further geological observations of outcrop that may influence geochemistry e.g. colour, minerals present etc in card 5.
3	15-35	Contamination. Entered at site based on visual inspection of site and adjacent area of at least 100m. Should also include any contamination encountered in sample during augering. Each box (15-35) represents a different category of contamination which should be marked with “1” if observed. Numerous boxes may be filled at each site. An individual manufactured item that is present may comprise different categories of contaminant type, all of which should be noted. See guidance overlay for clarification of contamination code printed over top of each box. Further details of each contaminant should be given in box 5, Field Data Comments, including, location, size and abundance of each contaminant.
Card No	**Box No**	**Detail of Entry**
4	01-03	Depth of Soil Sample A (topsoil) in metres. Measurement in metres from ground surface to bottom of sampling interval – should include any depth of root zone material removed prior to augering. Normally 0.20 or 0.15m. A decimal point is included on the field card.
4	04-05	Colour of Soil Sample A. Entered at site, after visual examination of augered material, using code as per guidance overlay.
4	06-09	Texture of Soil Sample A. Entered at site, after using the “feel method” (Brady and Weil (1999)- see Table 5)) using code as per guidance overlay.
4	10	Moisture content of Soil Sample A. Entered at site after visual and manual examination of augered hole and sample.
4	11	Organic content of Soil Sample A. Entered at site, after visual and manual examination of augered material, using code as per guidance overlay.

4	13-35	Soil Clast Lithology in sample A. Entered at site after careful visual observation at site, area directly adjacent to site and during augering. Use abbreviated rock type names from Rock Classification Scheme as per guidance overlay. Rock types should be entered in order of decreasing abundance. Any overspill or further description should be entered in card 5, Field Data Comments.
4	36-38	Depth of Soil Sample S (subsurface-soil) in metres. Measured in metres from ground surface to bottom of sampling interval – should include any depth of root zone material removed prior to augering. Normally 0.50m but may vary due to encountering bedrock at shallow depth. Where peat cover is present every attempt should be made to penetrate this and collect mineral soil, thus depth may be substantially greater than 0.5m. A decimal point is included on the field card.
4	39-40	Colour of Soil Sample S. Entered at site, after visual examination of augered material, using code as per guidance overlay.
4	41-44	Texture of Soil Sample S. Entered at site, after using the "feel method" (Brady and Weil (1999) - see Table 5) using code as per guidance overlay.
4	45	Moisture Content of Soil Sample S. Entered at site after visual and manual examination of augered hole and sample.
4	46	Organic Content of Soil Sample S. Entered at site, after visual and manual examination of augered material, using code as per guidance overlay.
4	48-70	Soil Clast Lithology in Sample S. Entered at site after careful visual observation of augered material. Use abbreviated rock type names from Rock Classification Scheme as per guidance overlay. Rock types should be entered in order of decreasing abundance with a space left between each entry. Any overspill or further description should be entered in card 5, Field Data Comments.
Card No	**Box No**	**Detail of Entry**
5	01 onwards inc. back of field card	Field Data Comments. Entered at site. Card 5 allows samplers to add further information relating to coded observations in cards 1-4. Where contamination and pan, clast, bedrock minerals are observed further details must be given here. To allow unambiguous digital data entry, each observation should be preceded by the numeric identification of the coded observation to which it relates. e.g. 331 2 rounded grains Au, Indicates that the observation relates to Card 3, box 31 (pan minerals). Often the comments will exceed the space available in card 5 and should be continued on the unprinted back of the card.

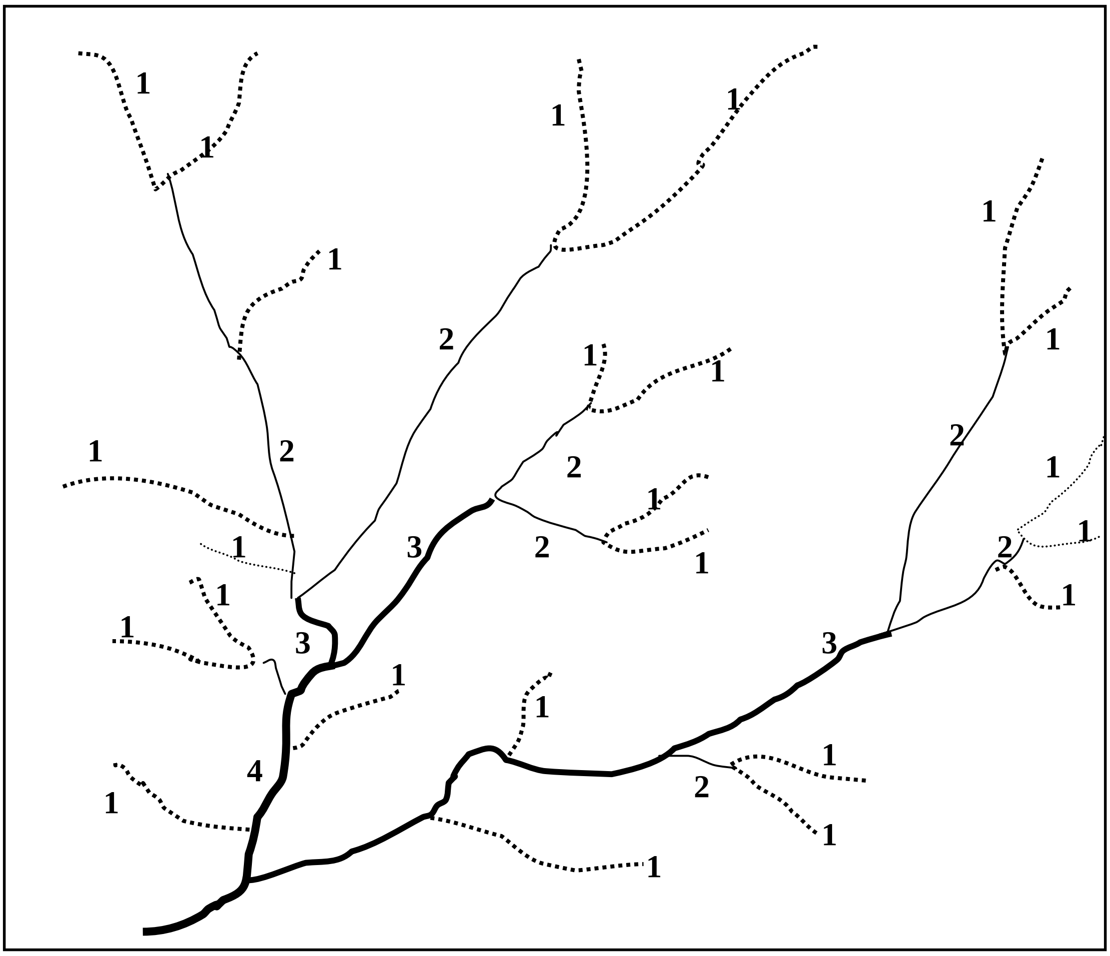


Figure 7: Strahler (1957) system for determining stream order

In order to compare streams within and among drainage areas a hierarchy of streams is determined. According to the Strahler system of stream ordering the end tributaries are designated as first order streams. Two first-order streams merge to form a second-order stream segment; two second-order streams join, forming a third-order and so on. It takes at least two streams of any given order joining to form a stream of the next higher order.

SOIL TEXTURE	CODE	DESCRIPTION
Sand	SAND	Soil consisting mostly of coarse and fine sand, and containing so little clay that it is loose when dry and not sticky when wet. Soil will not cohere into a ball, falls apart.
Silty Sand	SISA	Soil in which the sand fraction is still quite obvious, which moulds readily when sufficiently moist, but in most cases does not stick appreciably to the fingers. Ribbons do not form easily. Feels gritty.
Sandy Clay	SACL	The soil is plastic and sticky when moistened sufficiently, but the sand fraction is still an obvious feature as grittiness is the dominant feel. Forms ribbons longer than 5cm.
Sandy Silt	SASI	Soil in which the fractions are so blended that it moulds readily when sufficiently moist, and sticks to the fingers to some extent. It can, with difficulty, be moulded into ribbons no more than 2.5cm long.
Clay	CLAY	The soil is plastic and sticky when moistened sufficiently and gives a polished surface on rubbing. Capable of being moulded when moist into any shape and taking clear fingerprints.
Silty Clay	SICL	Soil which is composed almost entirely of very fine material but in which the smooth soapy feel prominent. Can form ribbons longer than 5 cm.
Silt	SILT	Soil in which the smooth, soapy feel of silt is dominant. Can form ribbons between 2.5cm and 5cm long.

Table 5: Description of the "feel method" for soil textures (based on Brady and Weil, 1999)

3 Field Database

3.1 INTRODUCTION

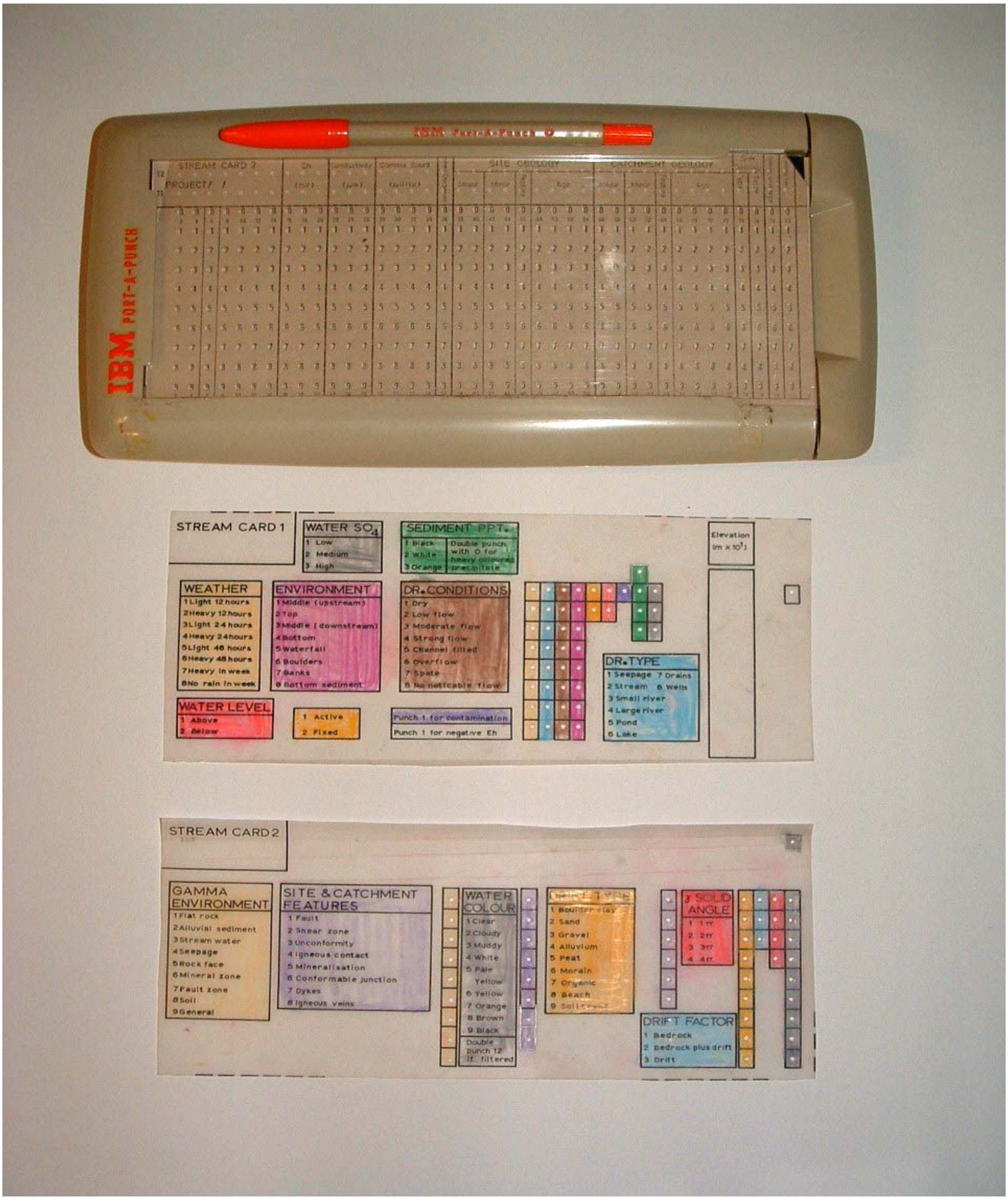
Since 1986, field observations recorded on G-BASE drainage and soil field cards have been transferred and stored digitally on computer. In the first instance, Philips PC2000 computers were used, with data being entered using ‘Cardbox’™ software. This coincided with the final year of sample collection on the Borders-Farne area (Southern Scotland atlas), and the commencement of sampling of the Tyne-Tees area. Field card data for all Borders samples collected before 1986 were entered retrospectively. Prior to the introduction of in-field digital data capture, all completed field data cards were returned, at the end of the field sampling campaign, to the Survey’s offices, where data were manually encoded on binary punch-cards. A trial of a portable punch card machine (see Photograph 1) for one field season was not successful and this method of recording data, although used on some overseas BGS mapping projects, was not adopted by G-BASE.

As the field database developed, a wider range of site parameters were incorporated and dBase II™ was used as the field database software package. In the late 1980s and throughout the early to mid 1990s, computing facilities within the BGS Geochemistry Group were based upon Apple Macintosh machines, and for this reason the database migrated to the Macintosh platform, using the FoxBASE+/Mac™ relational database software. Apple Workbook computers were introduced as the standard G-BASE field laptops in the early 1990s, and remained in use until 1997. Data were transferred from the card to the field database at the team’s base usually within a day of sample collection, a procedure which continues to this present day. This ensures that any problems with the data recording can be dealt with by the samplers during the time of field work.

Following the BGS corporate policy to use PC rather than Apple computers, G-BASE developed a completely new field database to run on a PC using MicroSoft Windows. Designed using Microsoft Access 98™ and running on laptop PCs, the prototype database entitled Stream98, was used for field data card capture during the summer of 1998. Similar field databases where also developed at this time for BGS's international geochemical mapping projects (Johnson et al, 2001).

An on-screen version of the field cards, allowing data input to be undertaken in a similar manner to the completion of a field card at site was designed within MS Access, using the ‘Create Forms Wizard’. Wherever possible, the input data were restricted to selective definitions, stored in tables within the database. Acceptable codes for input fields are accessed by means of drop-down lists.

Based on this design, a similar MS Access database was developed for digital data from urban areas. The urban field database was first used in 1998 for Peterborough and Corby. Since these initial areas, modified versions of the regional database have been used in urban areas for soil only entry and including a more extensive range of land uses. The soil card version described by this report no longer make the distinction between urban and rural soils and similarly there is no longer any different form of field database for urban areas.



Photograph 1: Portable IBM binary punch card instrument tried in the early days of the project

3.2 CURRENT FIELD DATABASE

The current October 2004 version of the database is a modification of that used in the 2004 summer campaign and includes a wider range of field observations and improved data entry. Using MS Access2000™ software, the database is compatible with the G-BASE field data cards 2005 version. The structure of the main field data table is shown in Table 6 and each field has a brief description of the data type to be entered into it. The code associated with the drainage form (Form_Sedi2005) and soil form (Form_Soil2005) is listed in Appendix 2:.

Data are entered into the database table, which is a single table for both drainage and soil sites, via input forms, which are custom designed to mimic the field cards. The majority of data, which can be entered into each field, are restricted to the content of linked tables and pull-down menus. Examples of these data tables are shown in Table 7 to Table 11. By restricting the input of data in this way, only accepted codes may be entered into the database. This greatly increases database integrity and removes the possibility of erroneous data being entered due to typographic mistakes. Table 12 shows the Combo Box definitions for data entry field *landuse*1. By selecting 'Yes' to 'Limit To List', only data contained in data table *Land Use* (Table 10) are acceptable entries in this field.

Other quality control steps have been built into the data entry process. These prevent duplicate sample site numbers from being entered, and will flag up any sample sites whose National Grid References (NGR) location lie outside the area of the sampling campaign boundaries. These routines are included in the form code listed in Appendix 2:.

Field2005 : Table

Field Name	Data Type	Description
Project_Code	Number	Two digit code unique to individual Project Area
Site_Number	Number	Four digit site number. Prefixed by Project_Code gives unique sample identifier
Protocol	Text	GBASE sampling protocol used
Card Version	Text	GBASE field data card used
Duplicate	Yes/No	Indicates whether a field duplicate was collected
Samp_C	Text	Indicates whether a sediment sample was collected
Samp_P	Text	Indicates whether a panned heavy mineral concentrate was collected
Samp_W	Text	Indicates whether water samples were collected
Samp_A	Text	Indicates whether a surface soil sample was collected
Samp_S	Text	Indicates whether a sub-surface soil sample was collected
Samp_STD	Text	Indicates whether a sample is for control purposes
Easting	Number	BNG East
Northing	Number	BNG North
Ref_map	Number	OS map number
Map_Scale	Text	Scale of OS map
Collectors	Text	Collectors initials. Card writer first
Date	Date/Time	Date of sample collection
Dup_sample	Number	If field duplicate collected, number of duplicate sample
Stm_order	Text	Stream order - Strahler's system
Drain_type	Text	Drainage type
Drain_cond	Text	Drainage condition
Weather	Text	Weather conditions
PPT_orange	Text	Indicates presence of orange precipitates on stream clasts
PPT_brown	Text	Indicates presence of brown precipitates on stream clasts
PPT_black	Text	Indicates presence of black precipitates on stream clasts
Sed_colour	Text	Colour of sediment
Sed_clay	Text	Indicates clay content of sediment
Sed_organic	Text	Indicates organic content of sediment
Contam1	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam2	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam3	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam4	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam5	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam6	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam7	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam8	Text	Contamination observed at site which may affect sample and/or contamination within sample
Contam9	Text	Contamination observed at site which may affect sample and/or contamination within sample
Land_use1	Text	Predominant land use(s) at site
Land_use2	Text	Predominant land use(s) at site
Land_use3	Text	Predominant land use(s) at site
Clast1	Text	Clasts observed in stream
Clast2	Text	Clasts observed in stream
Clast3	Text	Clasts observed in stream
Clast4	Text	Clasts observed in stream
Clast5	Text	Clasts observed in stream
Clast6	Text	Clasts observed in stream
Clast7	Text	Clasts observed in stream
Clast8	Text	Clasts observed in stream
Bedrock	Text	Indicates presence and amount of bedrock at or very near to site
Drift1	Text	Predominant drift cover at site or influencing site
Drift2	Text	Predominant drift cover at site or influencing site
Drift3	Text	Predominant drift cover at site or influencing site

Table 6: Structure of the MS Access field database table Field2005

Field2005 : Table

Field Name	Data Type	Description
Drift4	Text	Predominant drift cover at site or influencing site
Slope	Text	Indicates angle of slope of soil sample site
Site_geol1	Text	If outcrop present, indicates the rock type, as observed by samplers - sediment sites only
Site_geol2	Text	If outcrop present, indicates the rock type, as observed by samplers - sediment sites only
Cat_geol1	Text	If no outcrop present, indicates the rock type as shown on geology map - sediment sites only
Cat_geol2	Text	If no outcrop present, indicates the rock type as shown on geology map - sediment sites only
Map_geol1	Text	Indicates the rock type as shown on geology map - soil sites only
Map_geol2	Text	Indicates the rock type as shown on geology map - soil sites only
Pan_min1	Text	Observed mineral(s) in panned concentrate
Pan_min2	Text	Observed mineral(s) in panned concentrate
Pan_min3	Text	Observed mineral(s) in panned concentrate
Pan_min4	Text	Observed mineral(s) in panned concentrate
Pan_min5	Text	Observed mineral(s) in panned concentrate
Pan_min6	Text	Observed mineral(s) in panned concentrate
Min_bed1	Text	Observed mineral(s) in bedrock
Min_bed2	Text	Observed mineral(s) in bedrock
Min_bed3	Text	Observed mineral(s) in bedrock
Min_clast1	Text	Observed mineral(s) in clasts
Min_clast2	Text	Observed mineral(s) in clasts
Min_clast3	Text	Observed mineral(s) in clasts
Minbed_Style	Text	Style of mineralisation in bedrock
Wat_colour	Text	Stream water colour
Susp_solid	Text	Indicates presence of suspended solid material in stream water
SoilA_colour	Text	Colour of surface soil
SoilS_colour	Text	Colour of sub-surface soil
SoilA_text	Text	Texture of surface soil
Depth_A	Text	Depth to base of surface soil sample
Depth_S	Text	Depth to base of sub-surface soil sample
Organic_A	Text	Indicates abundance of organic material in surface soil sample
Organic_S	Text	Indicates abundance of organic material in sub-surface soil sample
A_clast1	Text	Clasts observed in surface soil sample
A_clast2	Text	Clasts observed in surface soil sample
A_clast3	Text	Clasts observed in surface soil sample
A_clast4	Text	Clasts observed in surface soil sample
A_clast5	Text	Clasts observed in surface soil sample
A_clast6	Text	Clasts observed in surface soil sample
S_clast1	Text	Clasts observed in sub-surface soil sample
S_clast2	Text	Clasts observed in sub-surface soil sample
S_clast3	Text	Clasts observed in sub-surface soil sample
S_clast4	Text	Clasts observed in sub-surface soil sample
S_clast5	Text	Clasts observed in sub-surface soil sample
S_clast6	Text	Clasts observed in sub-surface soil sample
A_moist	Text	Indicates moisture content of surface soil sample
S_moist	Text	Indicates moisture content of sub-surface soil sample
pH	Number	pH of stream water
Conduct	Number	Conductivity of stream water
Tot_alkali	Number	Total alkalinity of stream water
Bicarb	Number	Calculated bicarbonate content of stream water
Monitor	Yes/No	Indicates whether water sample is from a monitor site
Monitor Site	Text	If water sample is from monitor site, defines monitor site sample ID
Comments	Text	Additional information relevant to sample

Table 6 (cont): Structure of the MS Access field database table Field2005

Contamination : Table

Code	Description
A0	METAL
A1	Iron / Steel Wire
A2	Galvanised Iron
A3	Copper
A4	Lead
A5	Zinc
A6	Brass
A7	Aluminium
B0	CERAMICS
B1	Pottery
B2	Tiles
B3	Bricks
B4	Glazed China
C0	GLASS
C1	Clear Glass
C2	Coloured Glass
D0	PLASTICS
D1	Fertiliser Sack
E0	RUBBER
F0	CHEMICAL
F1	Paint
G0	LIQUID EFFLUENT
G1	Farm Effluent
G2	Domestic Effluent
G3	Industrial Effluent
H0	BULK INDUSTRIAL WASTE
H1	Metal Mine Tailings
H2	Coal Tailings
H3	China Clay Tailings
H4	Slag (Furnace Waste)
I0	AGRO-CHEMICALS
I1	Fertilisers
I2	Lime

Record: 34 of

Table 7: Table "Contamination"

Rocks2 : Table

Rock_Name	RCS_code
Agate	AGATE
Agglomerate	AGG
Andesite	AND
Anhydrite	ANHY
Ash	ASH
Basalt	BA
Breccia	BREC
Marl	CALSST
Chalk	CHLK
Chert	CHRT
Clay	CLAY
Carbonaceous Mudstone	CMDST
Coal	COAL
Coal Shale	COLSHL
Conglomerate	CONG
Dacite	DA
Diorite	DI
Dolomite	DL
Dolerite	DOLR
Dunite	DUN
Feldspathic Arenite	FAREN
Felsite	FELS
Ironstone	FEST
Flint	FLNT
Gabbro	GB
Granodiorite	GD
Granite	GN
Gneiss	GNSS
Gypsum	GYPS
Hornfels	HNFELS
Igneous Rock	IGRU
Lamprophyre	LMPY
Limestone	LMST
Marble	MARBLE
Mudstone	MDST
Metamorphic Rock	METR
Mylonite	MYLO
Oil Shale	OILS
Peridotite	PDT
Pelite	PEL
Pegmatite (Granite)	PGGN
Porphry	PPHY
Psammite	PSAMM
Quartzite	QZITE
Rhyolite	RY
Schist	SCH
Sandstone	SDST
Serpentinite	SEPITE
Siltstone	SLST
Slate	SLTE
Sedimentary Rock	SR
Tuff	TUF

Record: 52 of 52

Table 8: Table "Rocks2"

Code	Description
A1	Blown Sands
A4	Raised Beach
A5	Estuarine
B2	Alluvium (Terrace Deposits)
B3	Coarse Gravel
C1	Soil
C2	Marsh
C3	Peat Bog
D1	Clay with Flints
D3	Scree
E0	Glacial
E1	Till
E2	Moraine
E3	Fluvioglacial
F0	Made Ground (Undifferentiated)

Record: 1 of 15

Table 9: Table "Drift"

Code	Description
ABB0	Heather Moor
AC00	Rough Grazing
AEAA	Recent Deciduous Forest
AEAB	Mature Deciduous Forest
AEBA	Recent Coniferous Forest
AEBB	Mature Coniferous Forest
BAB0	Pasture
BD00	Arable
C000	Port areas And Airfields
DAC0	Urban Open Space
DD00	Recreational
E000	Industrial
EAC0	Metal Manufacture
EB00	Extractive

Record: 1

Table 10: Table "Land use"

Code	parent	Translation	Definition
7A11	7A10	Gold	Gold
7B11	7B10	Pyrite	Pyrite, Pyrites or Iron Pyrites
7B13	7B10	Pyrrhotite	Pyrrhotite
7B16	7B10	Bornite	Bornite
7B17	7B10	Chalcopyrite	Chalcopyrite
7B41	7B40	Galena	Galena
7B42	7B40	Sphalerite	Sphalerite
7B51	7B50	Cinnabar	Cinnabar
7B61	7B60	Realgar	Realgar
7B64	7B64	Arsenopyrite	Arsenopyrite
7B67	7B60	Stibnite	Stibnite
7B71	7B70	Molybdenite	Molybdenite
7D11	7D10	Quartz	Quartz, Amethyst, Citrine, Rock Crystal
7D12	7D10	Magnetite	Magnetite
7D31	7D30	Hematite	Hematite
7D51	7D50	Cassiterite	Cassiterite
7D52	7D50	Rutile	Rutile
7DH1	7DH0	Chromite	Chromite
7E11	7E10	Ilmenite	Ilmenite
7F52	7F50	Fluorite	Fluorite
7H13	7H10	Calcite	Calcite
7I14	7I10	Baryte	Baryte
7J14	7J10	Monazite	Monazite
7L63	7L60	Wolframite	Wolframite
7L64	7L60	Scheelite	Scheelite
7P00	7000	Mica	Mica
7Q00	7Q00	Epidote	Epidote
7Q10	7Q00	Olivine	Olivine
7Q40	7Q00	Garnet	Garnet
7T26	7T20	Zircon	Zircon or Hyacinth
7V4D	7V40	Tourmaline	Tourmaline or Schorl

Record: 1 of 31

Table 11: Table "Panmins"

Combo Box: landuse1

Format | Data | Event | Other | All

Name	landuse1
Control Source	Land_use1
Format	
Decimal Places	Auto
Input Mask	
Row Source Type	Table/Query
Row Source	SELECT DISTINCTROW [Land Use].[Code], [Land Use].[Description] FROM [Land Use];
Column Count	2
Column Heads	No
Column Widths	1.06cm;6cm
Bound Column	1
List Rows	15
List Width	7cm
Status Bar Text	
Limit To List	Yes
Auto Expand	Yes
Default Value	
Validation Rule	
Validation Text	
Visible	Yes
Display When	Always
Enabled	Yes
Locked	No
Allow AutoCorrect	Yes
Tab Stop	Yes
Tab Index	14
Left	0.414cm
Top	4.58cm
Width	1.393cm
Height	0.466cm
Back Style	Normal
Back Color	16777215
Special Effect	Sunken
Border Style	Solid
Border Color	0
Border Width	Hairline
Fore Color	0
Font Name	MS Sans Serif
Font Size	8
Font Weight	Normal

Table 12: Example of Combo Box definitions for data field "landuse1"

3.3 ENTERING DATA INTO THE FIELD DATABASE

The field database is populated at the field base on a portable PC. Data are usually transferred from field cards the day after sample collection so any problems with the field cards can be resolved with the sample collectors immediately after samples were collected.

The database is loaded by clicking the shortcut on the PC desktop. An autorun macro loads up the following screen (Figure 8).

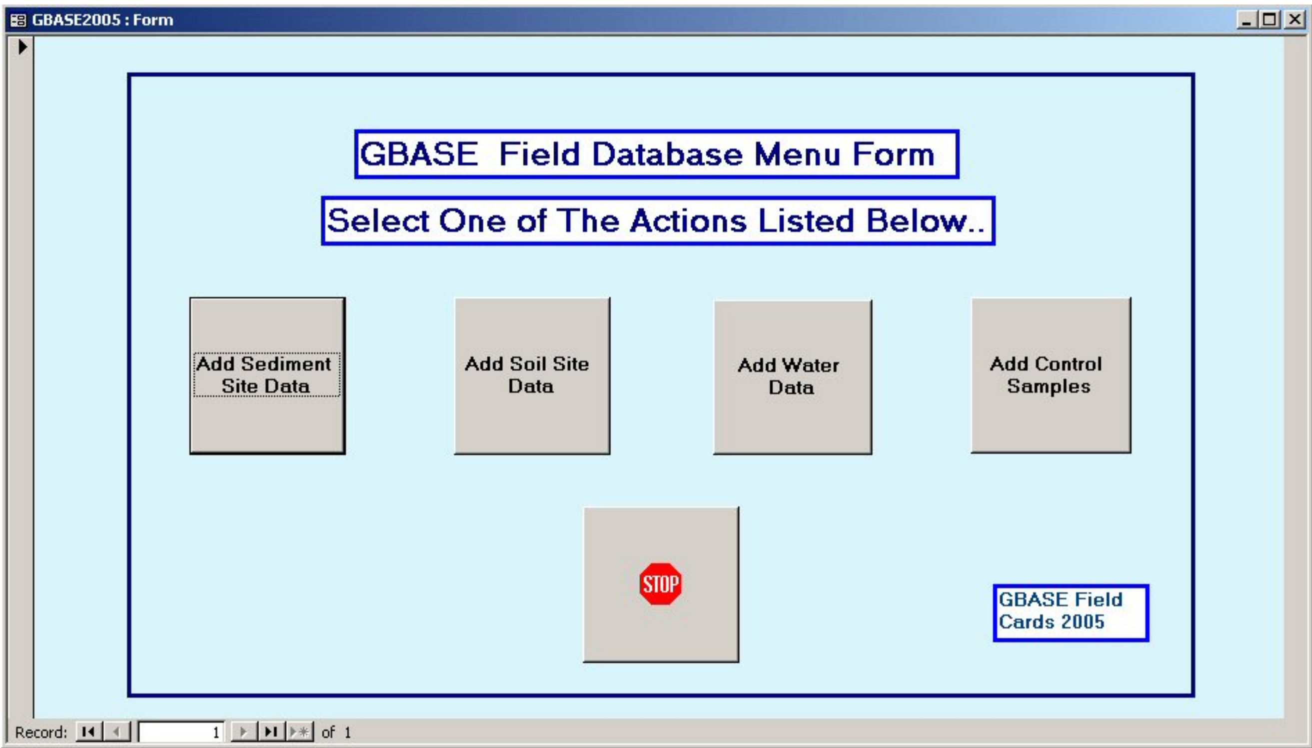


Figure 8: Field database start-up screen

3.3.1 Add sediment site data

On selecting the "Add Sediment Site Data" option an empty version of the input form (Figure 9) will appear. Nearly all the entries required on the form are selected by drop down lists which are activated by clicking on the little down arrow to the right of each data entry box. The user will be guided from box to box starting on the first row and progressing from left to right. If the user tries to exit to the next record before all required fields are entered then a warning message will be displayed. Fields are described in more detail in Table 3.

i. ***Project*** - automatically filled with the default number

ii. ***Site*** - enter 4 digit number. If number has been entered before then a request will be made to re-enter the number

iii. ***Duplicate*** - If the site is a duplicate site this box should be completed by clicking on it. A box will then appear for the "Dup Site" which should be completed as above. Duplicate forms are then completed as normal cards (see also Section 3.3.4).

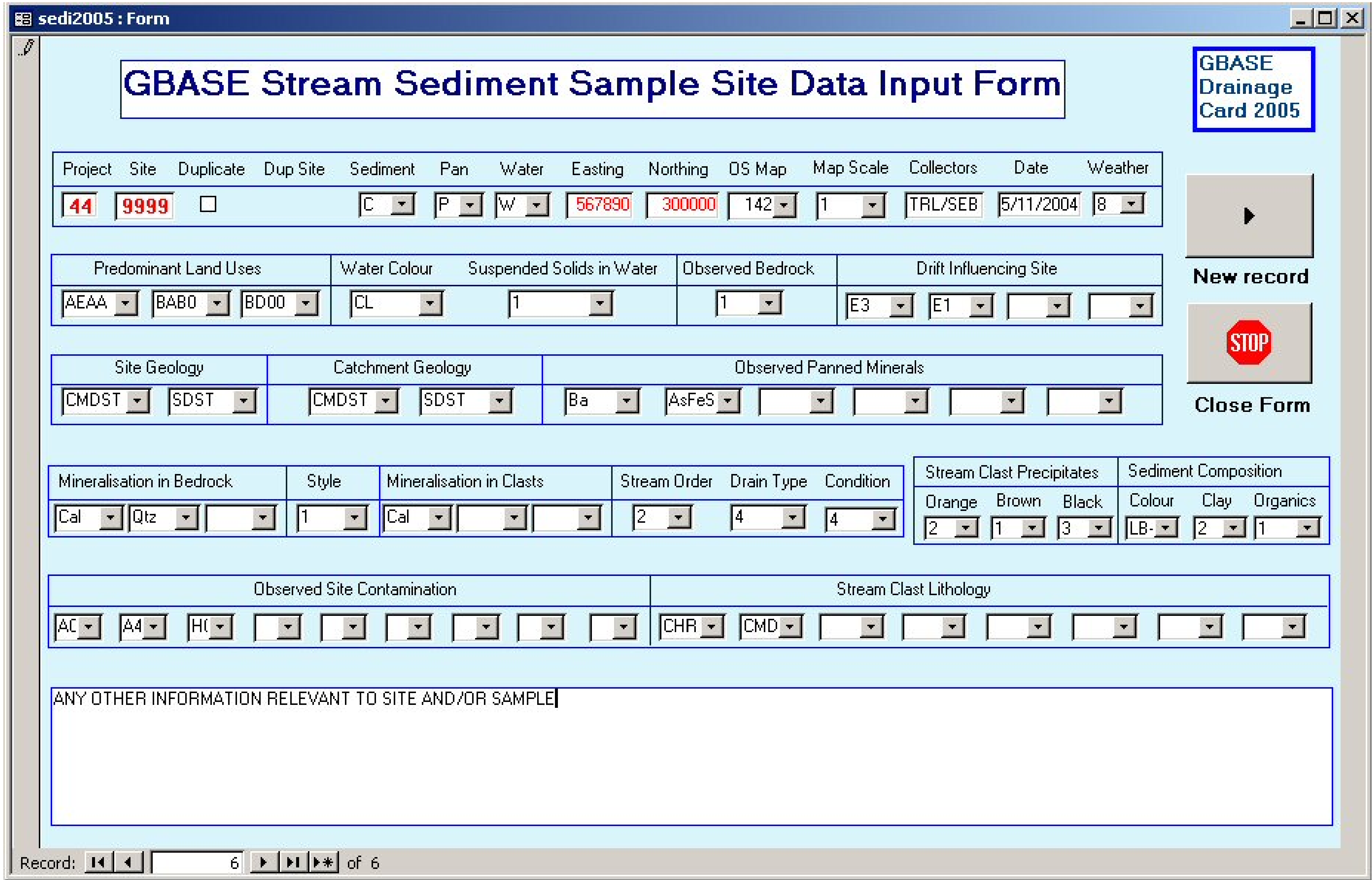
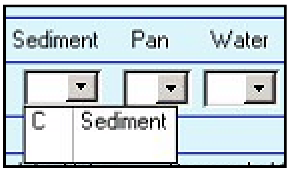


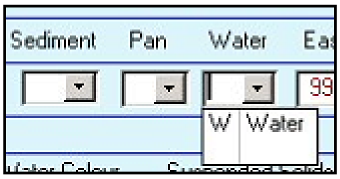
Figure 9: Stream sediment sample site data input form

iv. ***Sediment*** - select from list as shown



v. ***Pan*** - select from list as shown

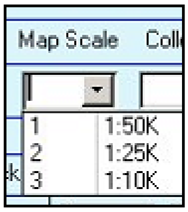
vi. ***Water*** - select from list as shown



vii. ***Easting and Northing*** - completed as six digit numbers. Values lying outside the area predefined in the Easting and Northing field properties in the database will be rejected. The database manager will define these validation limits when preparing the database before the fieldwork commences

viii. ***OS Map*** - select from list as shown. The database manager will prepare this list for the field area being sampled so only the map sheets that will be used in the field campaign are shown

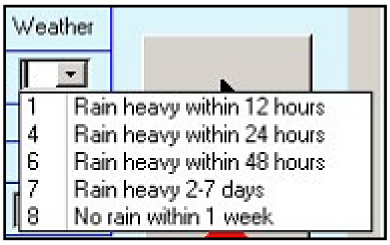
ix. ***Map Scale*** - select from list as shown



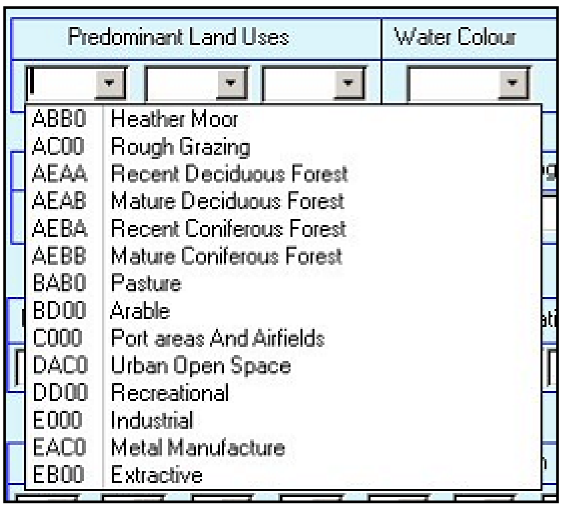
x. ***Collectors*** - entered as collector 1 initials, forward slash, collector 2 intials, e.g. TRL/SEB or NB/CCJ

xi. ***Date*** - format is forced into entry as dd-mm-yr

xii. ***Weather*** - select from list as shown

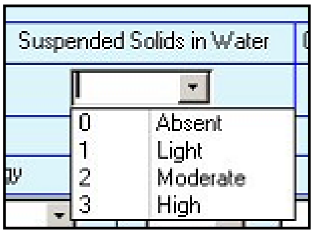


xiii. ***Predominant Land Uses*** - select from list as shown. Up to three land uses allowed given in order of prominence

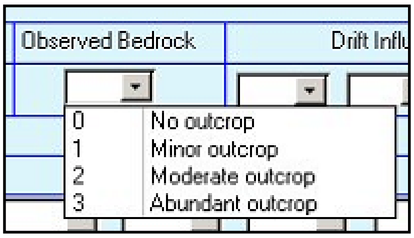


xiv. ***Water Colour*** - select from list as shown. A very restricted list of water colours are allowed

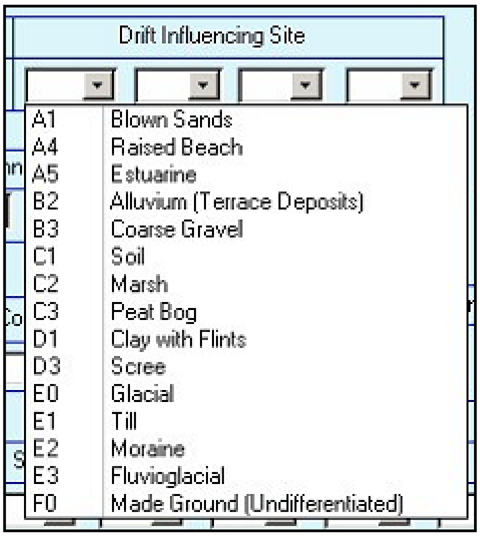
xv. ***Suspended Solids in Water*** - select from list as shown



xvi. ***Observed Bedrock*** - select from list as shown

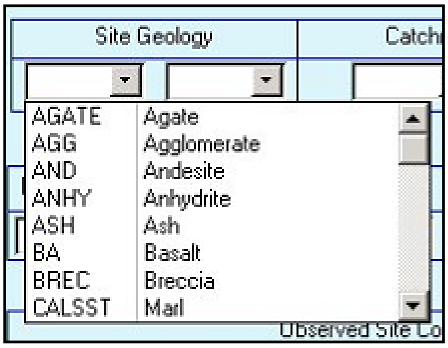


xvii. ***Drift Influencing Site*** - select from list as shown. Four types of drift may be entered ordered in level of prominence

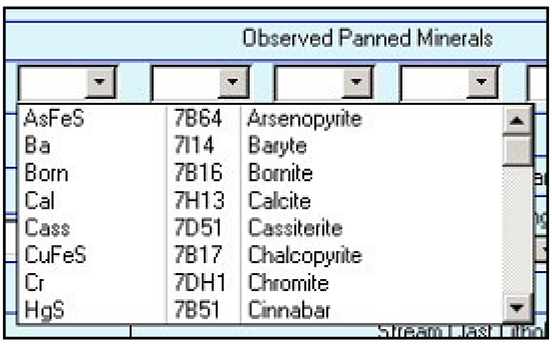


xviii. ***Site Geology*** - select from list as shown. Major site geology in first box, minor geology in second box

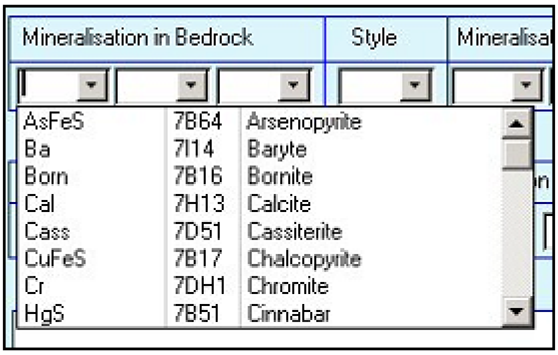
xix. ***Catchment Geology*** - as per Site Geology



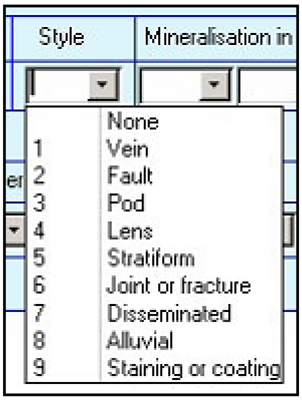
xx. ***Observed Panned Minerals*** - select from list as shown. Up to six boxes to complete in order of abundance



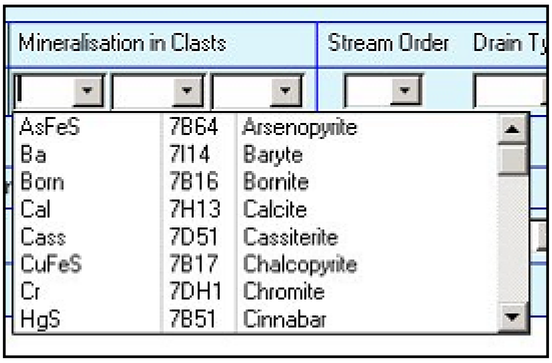
xxi. ***Mineralisation in bedrock*** - select as shown from list. Up to three boxes to complete listed in order of prominence. Details of the lithology associated with the mineralisation are given in the comments field. It is a deficiency of the field card/database that the mineralisation is not formally associated with a lithology. When the Geochemistry Database is populated, to satisfy the requirement that the mineralisation must be associated with a lithology, then the RSC term ROCK should be used.



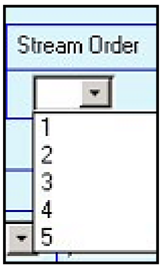
xxii. ***Style*** - select as shown. Described for main mineralisation. Other mineralisation to be described in comments box



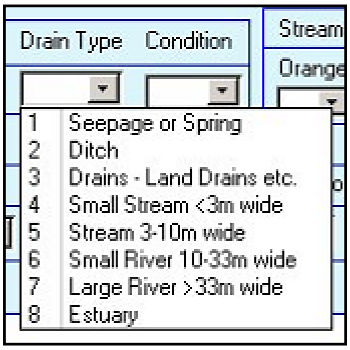
xxiii. ***Mineralisation in Clasts*** - select as shown from list. Up to three minerals can be entered in order of prominence. Style for mineralisation in clasts is not entered here but in the Geochemistry Database is assigned as "undifferentiated clast mineralisation". Similarly the mineralisation is not associated with any of the clast lithologies. On transfer to the Geochemistry Database this will be assigned as "ROCK" lithology.



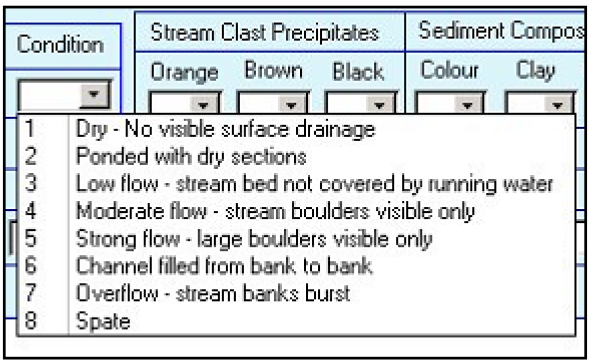
xxiv. ***Stream Order*** - select as shown from list



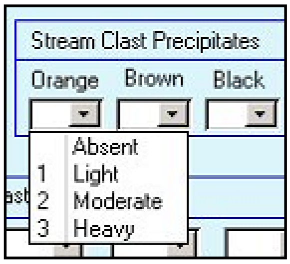
xxv. ***Drain Type*** - select as shown from list



xxvi. ***Condition*** - select as shown from list

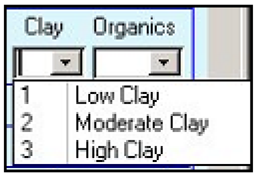


xxvii. ***Stream Clast Precipitates*** - select from list as shown. For each of the three possible colours an abundance has to be selected

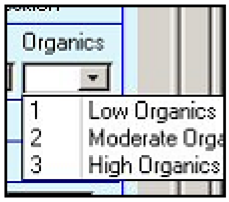


xxviii. ***Sediment Composition: Colour*** - select from list as shown. There is a very restricted range of colours from which a value must be selected

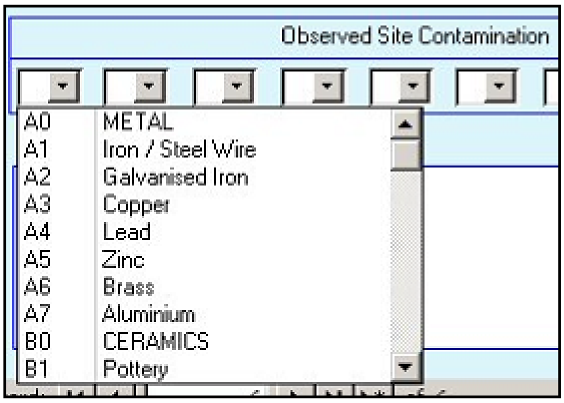
xxix. ***Sediment Composition: Clay*** - select from list as shown



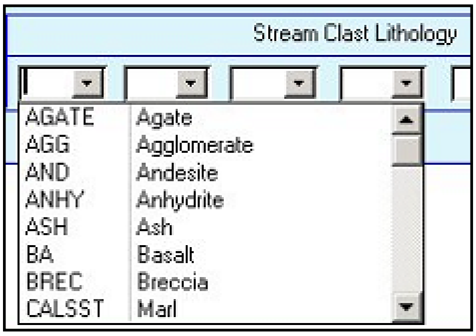
xxx. ***Sediment Composition: Organics*** - select from list as shown



xxxi. ***Observed Site Contamination*** - select from list as shown. Zero to nine boxes can be completed. Filled in order of abundance



xxxii. ***Stream Clast Lithology*** - select from list as shown. Eight boxes available to be listed in order of prominence



xxxiii. ***Comments*** - the last box on the form is the comments box into which free text (up to 255 characters) can be entered. Remember to include any comments written on the back of the field card.

A completed form is shown in Figure 9.

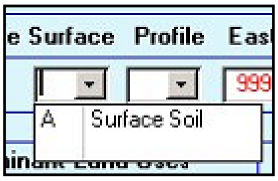
3.3.2 Add soil site data

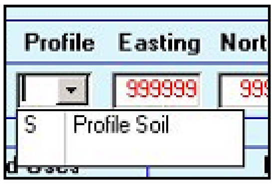
On selecting the "Add Soil Site Data" option an empty version of the input form (Figure 10) will appear. Nearly all the entries required on the form are selected by drop down lists which are activated by clicking on the little down arrow to the right of each data entry box. The user will be guided from box to box starting on the first row and progressing from left to right. If the user tries to exit to the next record before all required fields are entered Fields are described in more detail in Table 4.

i. ***Project*** - automatically filled with the default number

ii. ***Site*** - enter 4 digit number. If number has been entered before then a request will be made to re-enter the number

iii. ***Duplicate*** - If the site is a duplicate site this box should be completed by clicking on it. A box will then appear for the "Dup Site" which should be completed as above. Duplicate forms are then completed as normal cards (see also Section 3.3.4).



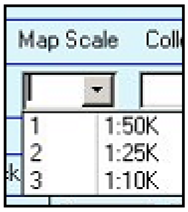


iv. ***Surface*** - select from list as shown

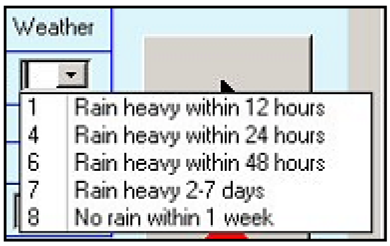
v. ***Profile*** - select from list as shown

vi. ***Easting and Northing*** - completed as six digit numbers. Values lying outside area predefined in the Easting and Northing field properties in the database will be rejected. The database manager will define these validation limits when preparing the database before the fieldwork commences

vii. ***OS Map*** - select from list as shown. The database manager will prepare this list for the field area being sampled so only the map sheets that will be used in the field campaign are shown



viii. ***Map Scale*** - select from list as shown

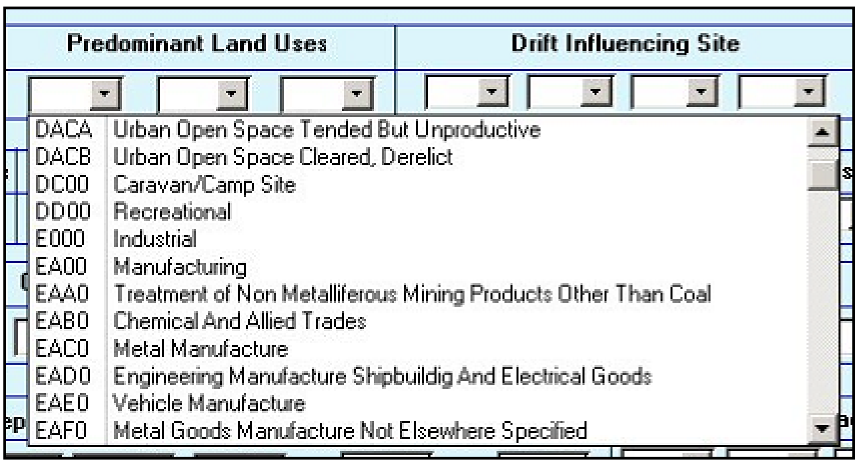


ix. ***Collectors*** - entered as collector 1 initials, forward slash, collector 2 intials, e.g. TRL/SEB or NB/CCJ

x. ***Date*** - format is forced into entry as dd-mm-yr

xi. ***Weather*** - select from list as shown

xii. ***Predominant Land Uses*** - select from list as shown. Up to three land uses allowed given in order of prominence



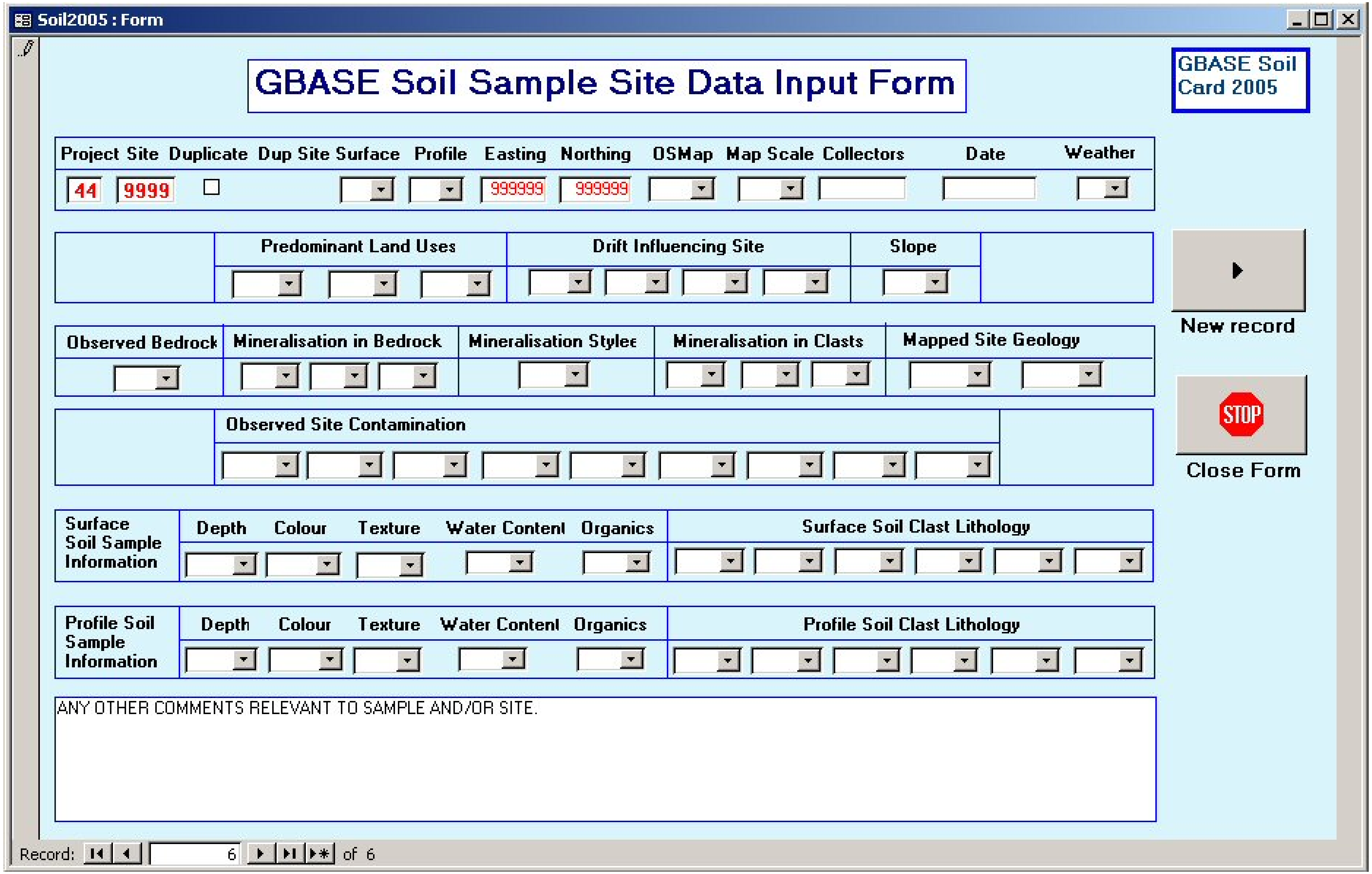
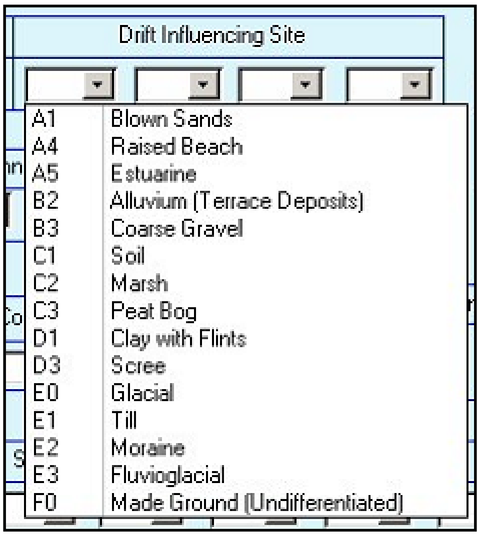
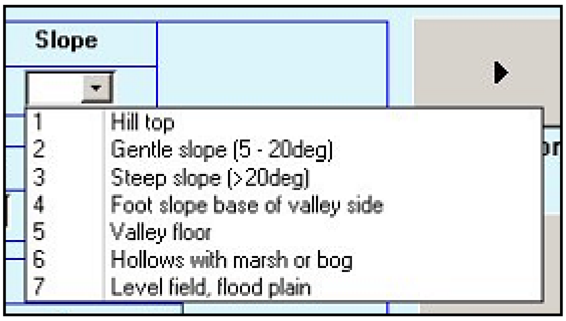


Figure 10: Soil sample site data input form

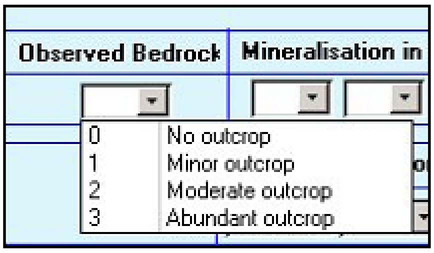
xiii. ***Drift Influencing Site*** - select from list as shown. Four types of drift may be entered ordered in level of prominence



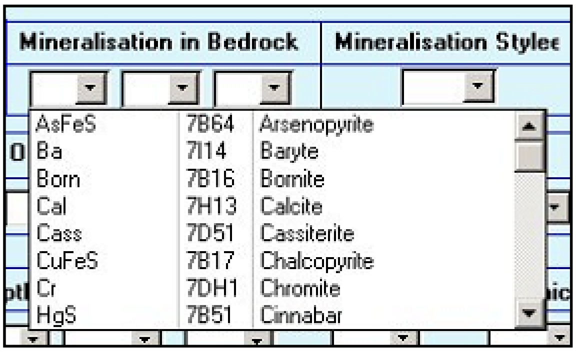
xiv. ***Slope*** - select from list as shown



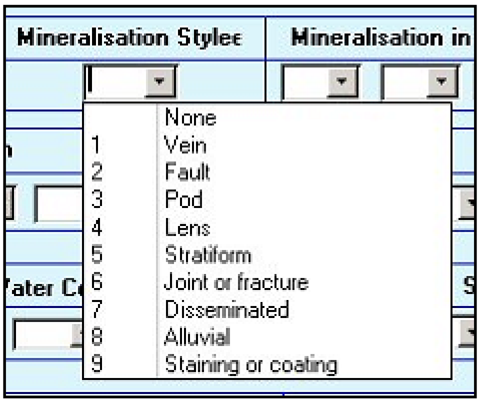
xv. ***Observed Bedrock*** - select from list as shown



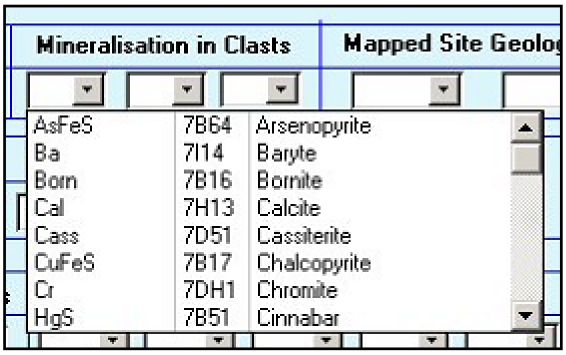
xvi. ***Mineralisation in Bedrock*** - select from list shown minerals occurring. Up to three boxes available listing in order of prominence. If there are more than three minerals than the comment field should be used. Details of the lithology associated with the mineralisation are given in the comments field. It is a deficiency of the field card/database that the mineralisation is not formally associated with a lithology. When the Geochemistry Database is populated, to satisfy the requirement that the mineralisation must be associated with a lithology, then the RSC term ROCK should be used.



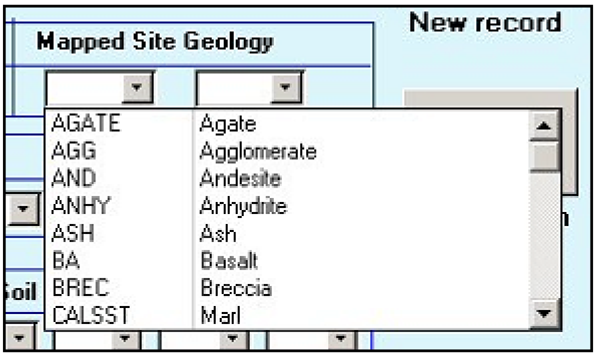
xvii. ***Mineralisation Style*** - select as shown. Described for main mineralisation. Other mineralisation to be described in comments box



xviii. ***Mineralisation in Clasts*** - select as shown from list. Style for mineralisation in clasts is not entered here but in the Geochemistry Database is assigned as "undifferentiated clast mineralisation". Similarly the mineralisation is not associated with any of the clast lithologies. On transfer to the Geochemistry Database this will be assigned as "ROCK" lithology.

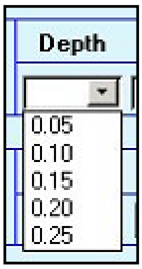


xix. ***Mapped Site Geology*** - select as shown from list. There are two boxes for site geology, the first box should be for the major occurrence



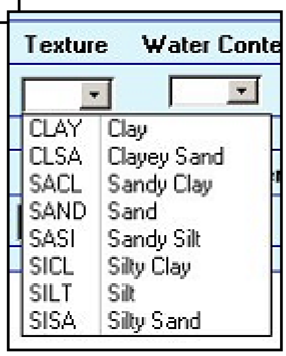
xx. ***Observed Site Contamination*** - select from list as shown. Zero to nine boxes can be completed. Filled in order of abundance

xxi. ***Surface Soil Sample Information: Depth*** - select from list as shown. Dept to base of sample in metres.

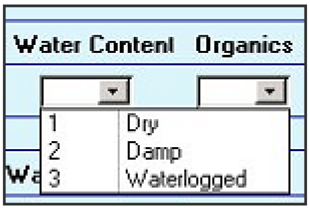


xxii. ***Surface Soil Sample Information: Colour*** - select from list as shown. There is a very restricted range of colours from which a value must be selected. These colours are translated into Munsell colour codes when transferred to the Geochemistry Database.

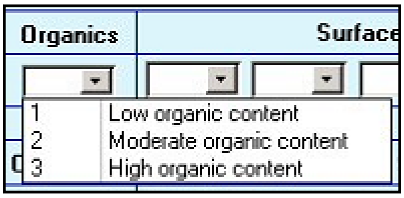
xxiii. ***Surface Soil Sample Information: Texture*** - select from list as shown



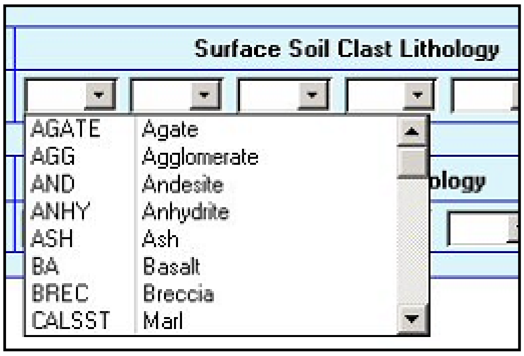
xxiv. ***Surface Soil Sample Information: Water Content*** - select from list as shown



xxv. ***Surface Soil Sample Information: Organics*** - select from list as shown



xxvi. ***Surface Soil Sample Information: Surface Soil Clast Lithology*** - select from list as shown. Provision for up to six lithologies to be entered in order abundance



xxvii. ***Profile Soil Sample Information*** - entered as per surface soil sample information described above.

xxxiv. ***Comments*** - the last box on the form is the comments box into which free text (up to characters) can be entered. Remember to include any comments written on the back of the field card.

3.3.3 Add water data

Results from field base determinations of pH, conductivity and total alkalinity on the stream water samples are added using this menu option. These are transferred from the field water data notebook and will include the daily water monitor site sample. Data are indexed first on date, then on site number to facilitate ease of entry. A filter selects only site numbers where a 'W' has been entered to indicate that a water sample was collected from that site. An example entry form is given in Figure 11. If a particular water sample is from a water Monitor Site, the 'Monitor Site' check-box on the input screen must be clicked to bring up the data entry field for the Monitor Site Sample ID (shown on Figure 12).

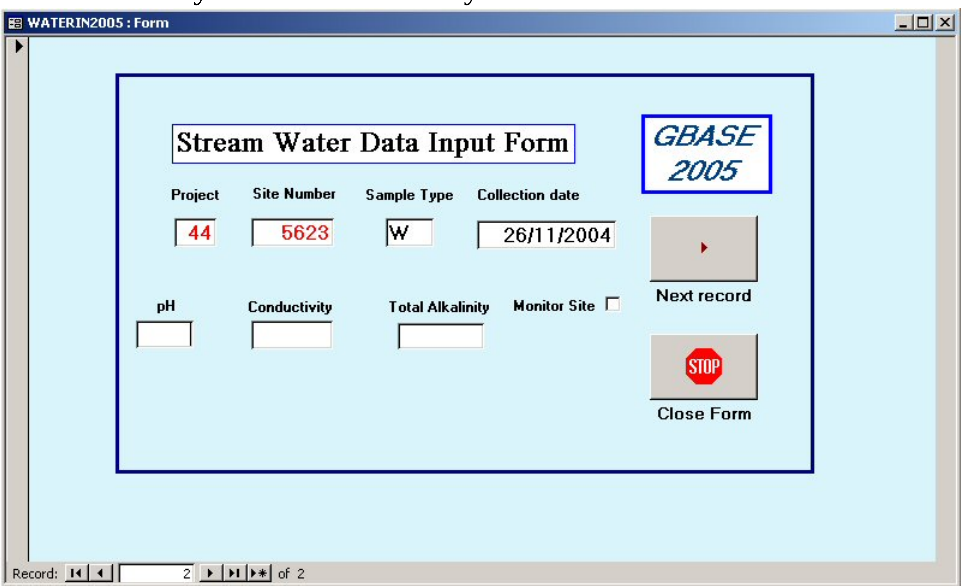


Figure 11: Form for entering stream water field analyses

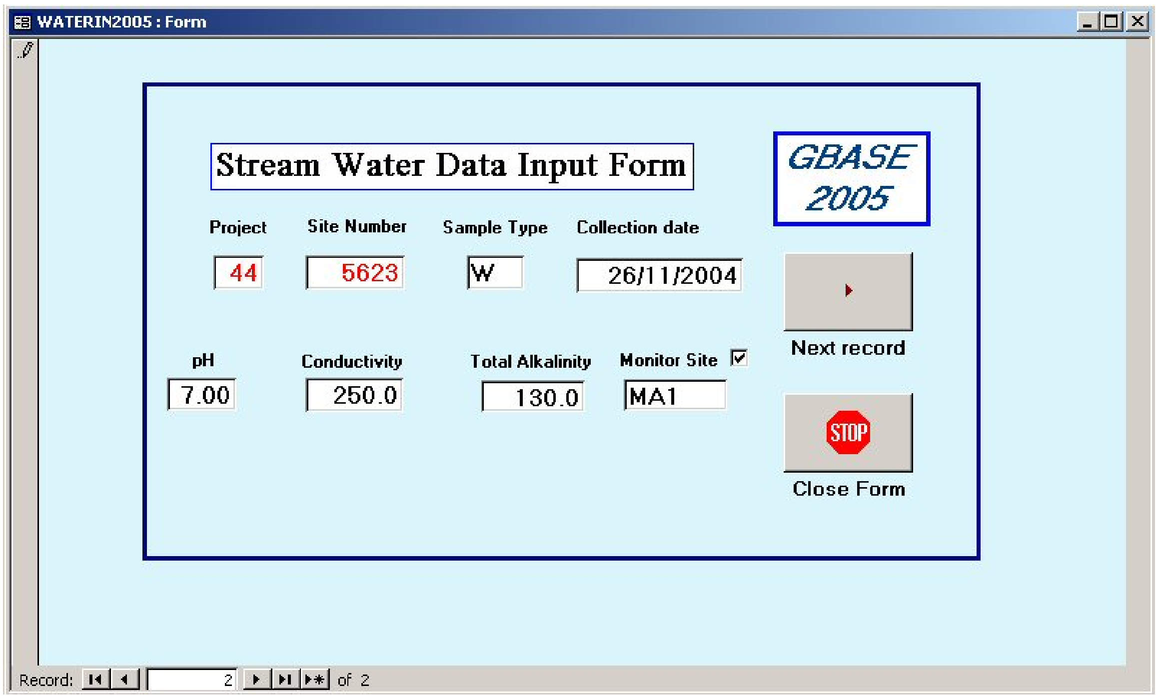


Figure 12: Stream water data input form for water monitor site

3.3.4 Add control samples

Within each batch of 100 samples, two numbers are allocated to G-BASE reference materials (coded as STD), and a further two numbers to laboratory splits, or sub-samples, of each field duplicate pair (coded SSA and SSB). Two sample numbers are also allocated to blank water samples (BW), inserted for quality control purposes during analysis of field water samples. This information is entered by selecting the 'Add Control Samples' option from the main menu (Figure 8) which opens the dialogue screen shown in Figure 13.

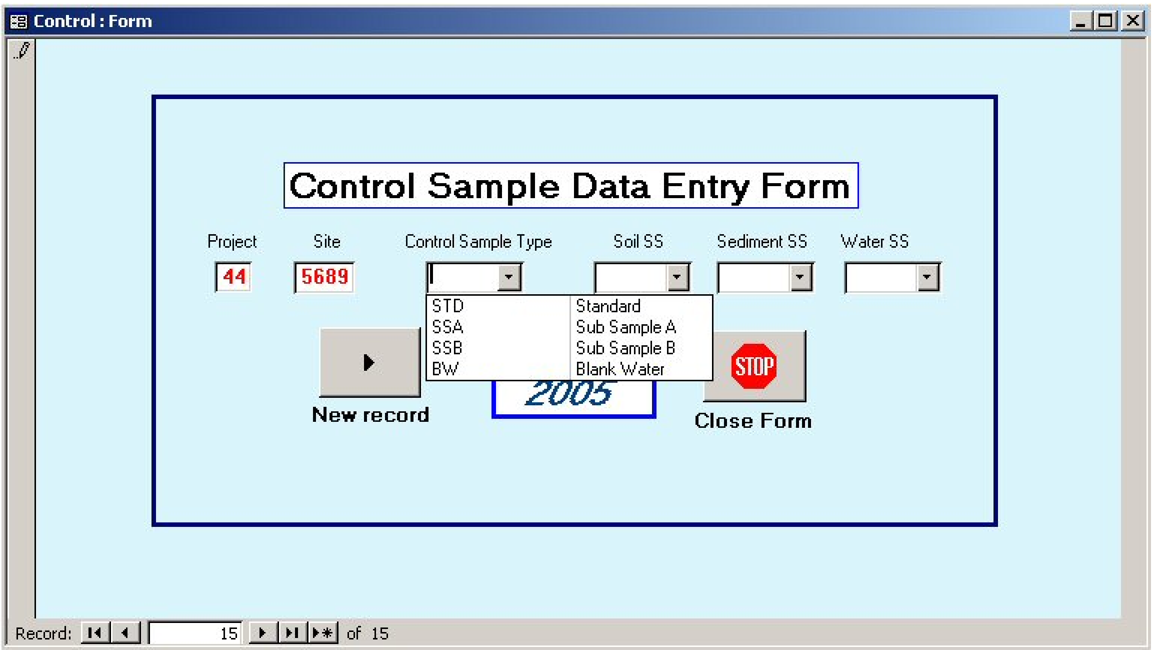


Figure 13: Control sample data entry form

Where the control sample type is either SSA or SSB, the type of the original sample must also be entered. In the case of soils, this is simply 'A' ('S' samples are not routinely analysed). In the case of sediments, this is 'C' and 'W' (see Figure 14) (unless the sample is from a dry site, in which case only 'C' applies).

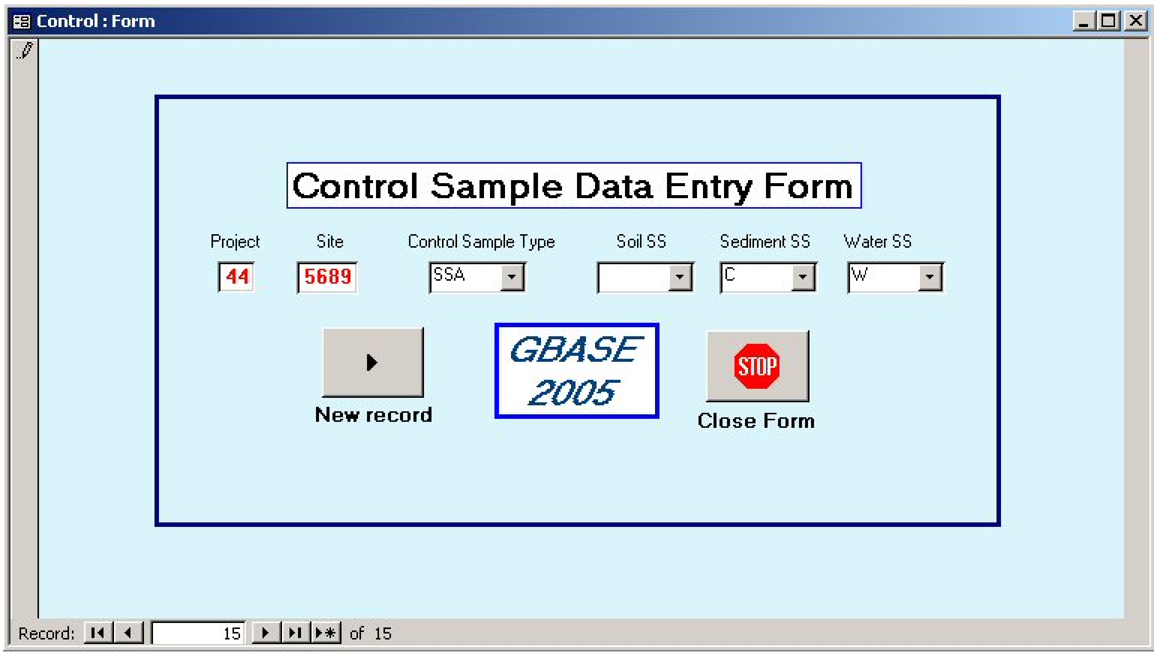


Figure 14: Control sample data entry form with sample type entered

In order to quantify the relative amount of error associated with sampling, sample preparation and analysis, a duplicate pair of field samples is routinely collected within each batch of 100 samples. During the entry of normal sample sites (drainage or soil), a field duplicate is recorded by clicking on the 'Duplicate' check box. This action activates data entry boxes to record the duplicate type (DUPA or DUPB) and the duplicate sample site number (Figure 15). On moving to the following field after entering the duplicate sample site number, the 'Dup Site' data field boxes are deactivated and become hidden once more.

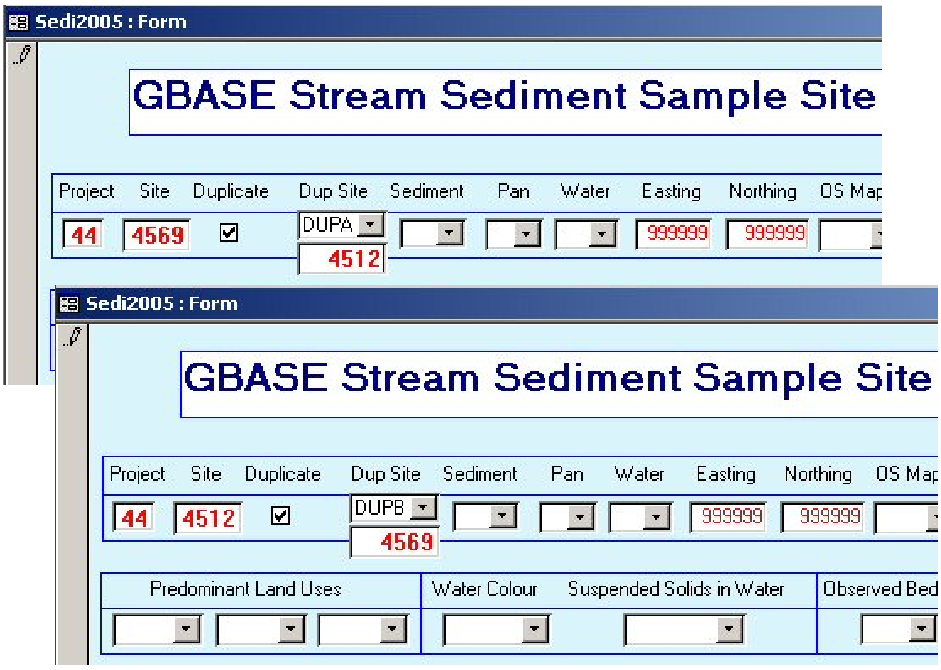


Figure 15: Example screens for the entry of DUPA and DUPB samples

3.4 END OF SEASON ERROR CHECKING THE FIELD DATABASE

At the end of each field season, two to three days (depending on the length of field season) are put aside for the voluntary workers (VWs) and team leaders to check that the information on the field cards, field database and map stable base is correct.

There are 2 distinct phases in checking the database:

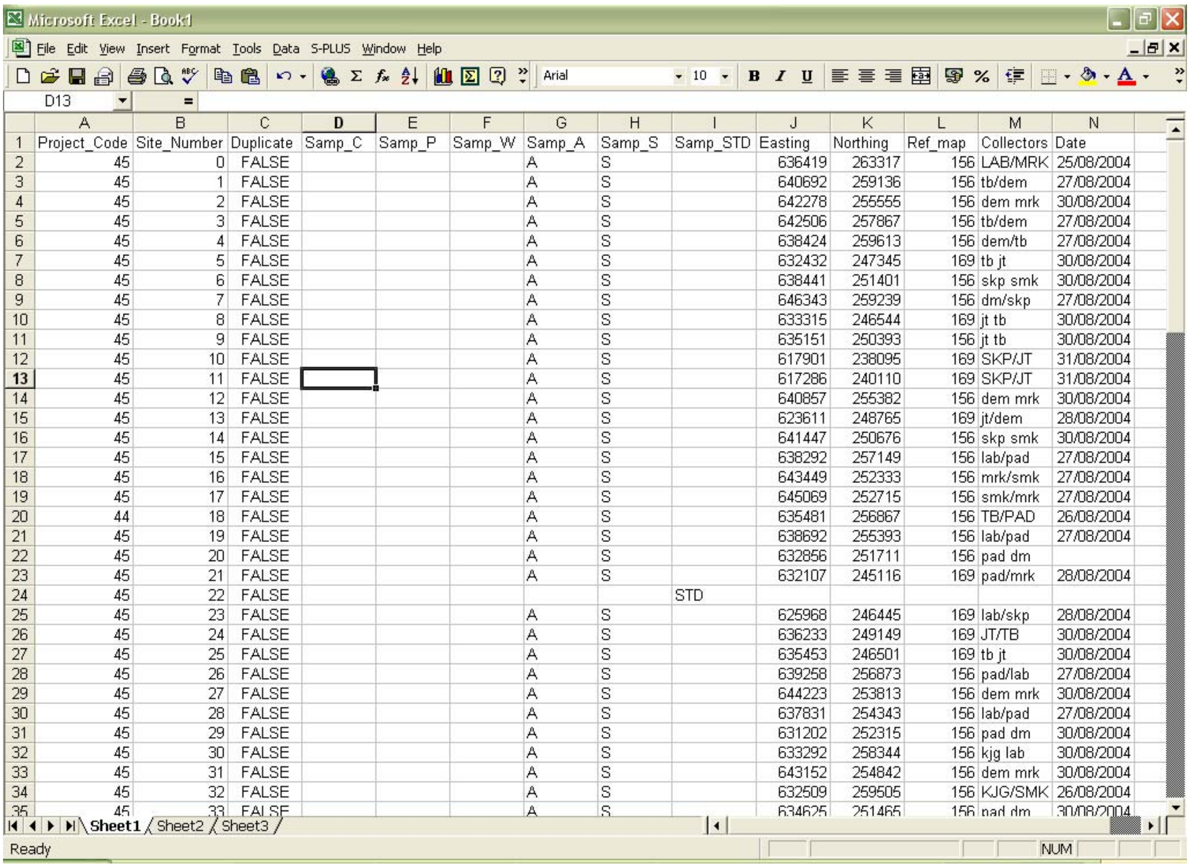
- Cross checking that the sample points have been plotted in the correct place on the stable base map using the information on the field cards
- Checking that the information on the first line of the field card is correct within the database

3.4.1 Cross checking the stable base

Each pair of VWs is issued with a batch of 100 field cards to check. All cards in a batch will be either soil or drainage samples. One VW will read out the coarse grid reference from the field card, the second then locates the grid square and will read out the sample number in that square. If this is incorrect this can be changed on the stable base map immediately. The VW checking the stable base will then read out the fine grid reference of the sample (with the help of a Knox Protractor) and the VW with the field cards will check that this is correct within 20 m. If the point has been incorrectly plotted it is repositioned in the correct location. When the batch of 100 cards has been checked, the pair will be issued with the next batch of 100 field cards and swap roles.

3.4.2 Checking the field database

To check the field database against the field cards, the team leader will print out the information shown in Figure 16 to match up with each batch of 100 field cards. Each pair of VWs is then issued with the printout and the corresponding batch of 100 field cards. One VW will read out the top row of information from the card, the other VW will check that this information matches the database. Any discrepancies between the cards and database will be resolved immediately and corrections to be made to the database will be marked on the printout. The team leader or an experienced voluntary worker will make any changes to the actual database.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Project_Code	Site_Number	Duplicate	Samp_C	Samp_P	Samp_W	Samp_A	Samp_S	Samp_STD	Easting	Northing	Ref_map	Collectors	Date
2	45	0	FALSE				A	S		636419	263317	156	LAB/MRK	25/08/2004
3	45	1	FALSE				A	S		640692	259136	156	tb/dem	27/08/2004
4	45	2	FALSE				A	S		642278	255555	156	dem mrk	30/08/2004
5	45	3	FALSE				A	S		642506	257867	156	tb/dem	27/08/2004
6	45	4	FALSE				A	S		638424	259613	156	dem/tb	27/08/2004
7	45	5	FALSE				A	S		632432	247345	169	tb jt	30/08/2004
8	45	6	FALSE				A	S		638441	251401	156	skp smk	30/08/2004
9	45	7	FALSE				A	S		646343	259239	156	dm/skp	27/08/2004
10	45	8	FALSE				A	S		633315	246544	169	jt tb	30/08/2004
11	45	9	FALSE				A	S		635151	250393	156	jt tb	30/08/2004
12	45	10	FALSE				A	S		617901	238095	169	SKP/JT	31/08/2004
13	45	11	FALSE				A	S		617286	240110	169	SKP/JT	31/08/2004
14	45	12	FALSE				A	S		640857	255382	156	dem mrk	30/08/2004
15	45	13	FALSE				A	S		623611	248765	169	jt/dem	28/08/2004
16	45	14	FALSE				A	S		641447	250676	156	skp smk	30/08/2004
17	45	15	FALSE				A	S		638292	257149	156	lab/pad	27/08/2004
18	45	16	FALSE				A	S		643449	252333	156	mrk/smk	27/08/2004
19	45	17	FALSE				A	S		645069	252715	156	smk/mrk	27/08/2004
20	44	18	FALSE				A	S		635481	256867	156	TB/PAD	26/08/2004
21	45	19	FALSE				A	S		638692	255393	156	lab/pad	27/08/2004
22	45	20	FALSE				A	S		632856	251711	156	pad dm	
23	45	21	FALSE				A	S		632107	245116	169	pad/mrk	28/08/2004
24	45	22	FALSE						STD					
25	45	23	FALSE				A	S		625968	246445	169	lab/skp	28/08/2004
26	45	24	FALSE				A	S		636233	249149	169	JT/TB	30/08/2004
27	45	25	FALSE				A	S		635453	246501	169	tb jt	30/08/2004
28	45	26	FALSE				A	S		639258	256873	156	pad/lab	27/08/2004
29	45	27	FALSE				A	S		644223	253813	156	dem mrk	30/08/2004
30	45	28	FALSE				A	S		637831	254343	156	lab/pad	27/08/2004
31	45	29	FALSE				A	S		631202	252315	156	pad dm	30/08/2004
32	45	30	FALSE				A	S		633292	258344	156	kjg lab	30/08/2004
33	45	31	FALSE				A	S		643152	254842	156	dem mrk	30/08/2004
34	45	32	FALSE				A	S		632509	259505	156	KJG/SMK	26/08/2004
35	45	33	FALSE				A	S		634625	251465	156	pad dm	30/08/2004

Figure 16: Example of field database printout (in MS Excel) used for checking

4 Transfer of field database into the Geochemistry Database

4.1 INTRODUCTION

Since the Geochemistry Database became active in the 1990s the role of transferring the field data from the G-BASE field database to the corporate ORACLE database has been shared by the G-BASE data manager and the Geochemistry Database manager (Bob Lister and Alan Mackenzie, respectively). Other geochemical data, principally that from the Mineral Reconnaissance Programme (MRP), has been loaded by Sue Hobbs. The transfer of G-BASE field data from one database to another has not been a high priority or resourced sufficiently, and much of the field data carefully collected by G-BASE remains unloaded. This manual seeks to establish protocols to address problems experienced during the past ten years of loading G-BASE field data. These include:

- the absence of a written protocol for the entire procedure from field card to the Geochemistry Database
- no clear statement of who is responsible for doing what in the process
- inadequacies in the Geochemistry Database for loading useful site and sample information from G-BASE field cards
- ad hoc use of undocumented "dummy fields" in the Geochemistry Database
- changes in corporate coding that have been introduced without considering the impact on the G-BASE codes
- failure to correctly translate simple codes used by G-BASE to more complex coding systems used by the Geochemistry Database
- reluctance to use ORACLE databases by G-BASE and BGS staff who have not had sufficient training or knowledge of accessing BGS ORACLE databases

This report does not seek to correct errors that already exist in the Geochemistry Database. That needs to be done during a more comprehensive audit and quality assessment of the database. The report hopes to establish a more systematic approach to the loading of field data from 2005 onwards so we can be confident as to the quality of site and sample information held in the database. Furthermore it is also important to establish the principal that the recording of field data by student samplers has to be done in a way that is efficient and simple for the samplers. The coding of field cards should not be driven solely by the requirements of the Geochemistry Database. However, to achieve this, data managers must establish and document satisfactory translations of codes to transfer data from the field database to the Geochemistry Database.

The unique sample ID in the Geochemistry Database is a combination of the **Numbering System**, **Project**, **Siteno** , **Sample Type** and **Duplicate** columns (see Appendix 1: for domain definitions), though in G-BASE the **Duplicate** field is redundant as duplicate samples from the same site have a different site number. In addition to these fields every unique sample ID should also be geographically referenced with **Easting** and **Northing**. These six columns are therefore the minimum compulsory requirement for entry into the Geochemistry Database from the G-BASE field database (the **Numbering System** is implicit and always equals 4 for G-BASE samples). Whilst it is a rule that no G-BASE chemical results are loaded to the Geochemistry Database without being geographically referenced, it must be noted that some non-geographically referenced geochemical data from non-G-BASE sources already exists in the database. With the transfer of raw analytical data direct from the laboratories to the Geochemistry Database via the BGS Laboratory Information Management System (LIMS), it has now also become necessary to load "field" data information for control samples, some of which will not have geographical coordinates.

Site and sample information from the field cards are used to interpret results and certain fields can be very useful for grouping data (e.g. by land use) or retrieving samples of interest (e.g. all samples in which gold was observed in the panned concentrate). Example retrievals from the Geochemistry Database using field card information are given in Appendix 3:.

Information required on the field cards has been developed over more than 35 years and is useful otherwise it would not be recorded. It is therefore desirable that as much of the field card information as possible be transferred into the Geochemistry Database. It is also recommended that from 2005 onwards the field cards are routinely scanned so the entire card is available digitally for the geochemist to use in interpretation. Currently, digital methods of field data entry are under development (see Section 2.3) but it is envisaged that field cards will continue to be used as the definitive hardcopy record of a sampled site.

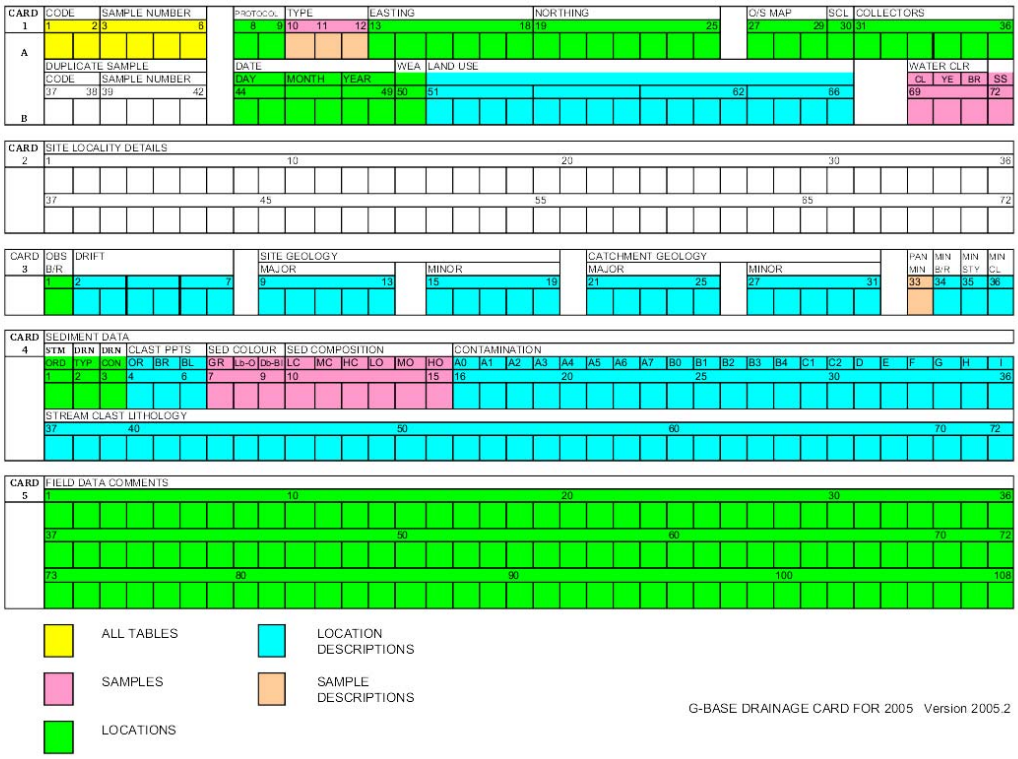


Figure 17: Figure summarising the subject areas in the Geochemistry Database to which field card columns are mapped

Fieldname	*e.g. row 1*	*e.g. row 2*	*Comments*
PROJECT_CODE	42	42	
SITE_NUMBER	1	2	
SAMPLING_PROTOCOL			
CODE_VERSION			
DUPLICATE	FALSE	FALSE	
SAMP_C	C	C	
SAMP_P	P	P	
SAMP_W	W	W	
SAMP_A			
SAMP_S			
SAMP_STD			
EASTING	423310	424020	
NORTHING	338200	339140	
REF_MAP	128	128	
MAP_SCALE	1	1	field database to translate 1 to 50
COLLECTORS	SC/JC	JC/SC	
DATE	17/06/1997	17/06/1997	
REL_SAMP			
STM_ORDER	3	3	
DRAIN_TYPE	4	4	
DRAIN_COND	4	4	
WEATHER	3	4	
PPT_ORANGE			
PPT_BROWN	1	1	
PPT_BLACK	1	1	
SED_COLOUR	LB-O	LB-O	
SED_CLAY	1	1	
SED_ORGANIC	2	1	
CONTAM1	A1	B3	
CONTAM2	B0		
CONTAM3			
CONTAM4			
CONTAM5			
CONTAM6			
CONTAM7			
CONTAM8			
CONTAM9			
LAND_USE1	BAB0	BAB0	
LAND_USE2	AEAA	AC00	
LAND_USE3			
CLAST1	SDST	SDST	
CLAST2	SLMDST	MDST	
CLAST3	QZITE	QZITE	
CLAST4	SLMDST		
CLAST5	MDST		
CLAST6			
CLAST7			
CLAST8			
BEDROCK	1	1	
DRIFT1	C1	C1	
DRIFT2		E1	
DRIFT3			
DRIFT4			

continued…

Table 13: Example of field data in EXCEL format ready for loading to the Geochemistry Database

(*Note that the columns and rows have been transposed to fit on the page. For loading into the database using the LOADER application this file would be called field_data.xls)*

Fieldname	*e.g. row 1*	*e.g. row 2*	*Comments*
RELIEF			
SITE_GEOL1			
SITE_GEOL2			
CAT_GEOL1	3D00	3D00	always taken from map
CAT_GEOL2	3S00	3S00	always taken from map
MAP_GEOL1			always taken from map for soils
MAP_GEOL2			always taken from map soils
PAN_MIN1	7D31	7E11	
PAN_MIN2	7T26	7T26	
PAN_MIN3	7E11	7B41	
PAN_MIN4			
PAN_MIN5			
PAN_MIN6			
MIN_BED1		7D11	
MIN_BED2			
MIN_BED3			
MIN_CLAST1			
MIN_CLAST2			
MIN_CLAST3			
MINBED_STYLE			
WAT_COLOUR	Y	Y	
SUSP_SOLID	1	1	
SOILA_COLOUR			
SOILS_COLOUR			
SOILa_TEXT			
SOILS_TEXT			
DEPTH_A			
DEPTH_S			
ORGANIC_A			
ORGANIC_S			
A_CLAST1			
A_CLAST2			
A_CLAST3			
A_CLAST4			
A_CLAST5			
A_CLAST6			
S_CLAST1			
S_CLAST2			
S_CLAST3			
S_CLAST4			
S_CLAST5			
S_CLAST6			
A_MOIST			
S_MOIST			
pH	7.87	7.99	
CONDUCT	563	550	
TOT_ALKALI	147	135	
BICARB			= TOT_ALKALI * 0.8303
COMMENTS	168 BARBEI	167 RED BR	free text

Table 13 continued…

4.2 SITE AND SAMPLE INFORMATION TRANSFERRED FROM FIELD CARD

A diagrammatic representation of the information transferred from the field cards is given in Figure 17. Harris and Coats (1992) divide the complex Geochemistry Database into a number of subject areas - Locations; Location Descriptions; Samples; Sample Descriptions; Batch and Sample Information; and Analyte Determinations. A comprehensive list of all fields and their translation to Geochemistry Database columns is given in Appendix 4:. The detailed site description is not transferred to the Geochemistry Database.

As information is transferred from field card to field database, from field database to EXCEL spreadsheet and from EXCEL spreadsheet to the Geochemistry Database via the LOADER program there are a number of translations and additions that are carried out. These changes are as follows:

4.2.1 Transfer from field card to field database

The field database is not a digital replica of the field card columns. This is because space on the A5 field card is limited so entries that may apply to only a very small percentage of sites (e.g. observed mineralisation) are accommodated in the free text comments box rather than having dedicated columns. Extra fields are therefore generated in the field database which are not on the field card. The inputting of field cards into the field database is discussed in Section 3.3 and this describes how additional fields in the field database are derived from information recorded on the field card.

4.2.2 Transfer from field database to MS EXCEL Spreadsheet

Before the field database is exported to an MS EXCEL spreadsheet the MS Access database is subjected to a number of checking procedures described in Section 3.4.2. Water analyses (pH, conductivity and total alkalinity) carried out at the field database are added to the database from the "water chemistry book". These data represent additional information not recorded on the field cards.

4.2.3 Reformatting MS EXCEL Spreadsheet for LOADER application

An EXCEL spreadsheet example of a reformatted field database (including two rows of data) is given in Table 13 (though note that rows and columns have been transposed to fit the table on the page). Field data for loading into the Geochemistry Database needs to be in the form of a MS Excel spreadsheet called **field_data.xls** and having one or more of the columns that are listed in Table 13 and Appendix 4:. It is the responsibility of the G-BASE data manager or their deputy to prepare the Excel spreadsheet for data transfer. Columns do not have to be in any particular order but it is most important that for the LOADER application to work **the column headings must be exactly as given.** When drainage site information is being added the "Bicarb" field is added to the field data. This is derived from the "Tot_alkali" field and is equal to (Tot-alkali x 0.8303).

It should be noted that the field data transfer procedure now includes the loading control sample information to the Geochemistry Database. In the Excel spreadsheet for transferring data there will be three fields. DUPLICATE, SAMP_STD and REL_SAMP. The first has either a TRUE or FALSE value, it's a bit obsolete but is in the field database and will maintain a consistency with past loaded field data. SAMP_STD will have one of the codes given in Table 14. DUPC, SSC, DUPD and SSD are extra control samples used in urban soil sampling.

DUPA	Duplicate A (original sample)
DUPB	Duplicate B (collected at same site as Dup A)
DUPC	Duplicate C (original sample)
DUPD	Duplicate D (collected at same site as Dup C)
SSA	Subsample A (laboratory replicate of DUPA)
SSB	Subsample B (laboratory replicate of DUPB)
SSC	Subsample C (laboratory replicate of DUPC)
SSD	Subsample D (laboratory replicate of DUPD)
STD	Secondary ref. material (SRM) for A,S,C and W
BW	Blank water used only for W

Table 14: Table showing the control sample codes entered in the field database

The related sample number field (REL_SAMP) was previously called Dup_Sample but has changed its name because it should also include information about subsample number pairs. The REL_SAMP field will contain an integer site number of the related sample i.e DUPA will contain the site number of DUPB, DUPB will contain the sample number of DUPA; SSA will contain the sample number of DUPA; SSB will contain the sample number of DUPB; DUPC will contain the sample number of DUPD, DUPD will contain the sample number of DUPC; SSC will contain the sample number of DUPC; SSD will contain the sample number of DUPD. The REL_SAMP will be empty for STD and BW.

It will be important that the G-BASE data manager maintains a table indexing which standards correspond to which site numbers, in the case of water the standard will be different from the sediment standard, even though the sample number will be the same.

4.3 G-BASE BULK DATA LOADING APPLICATION (LOADER)

4.3.1 Introduction

G-BASE field data can be loaded using the LOADER application written by Alan Mackenzie (Mackenzie, 2002). The LOADER is a 16 Mbyte MS Access 2000 application that replaces the previous data loader program that was introduced in 1994 (Patel and Mackenzie, 1994). The original complex application used ORACLE SQLFORMS v4.5 and ran on a UNIX system. It was used for ten years but simpler MS Access applications have now made it obsolete, particularly as the need to load variously formatted text files of MRP data no longer exists. LOADER is a more specific data loading program designed to load G-BASE and GSUE field and analytical data whereas the initial application had broader application in that it allowed any geochemical data to be added. LOADER will load standard G-BASE sample types, i.e. soils, stream sediments, waters and panned concentrates. However, it can also be used to load non-G-BASE field card data, for these sample types if the data have been correctly formatted.

4.3.2 Requirements

LOADER is available for any member of the G-BASE team to use. However, loading data to the Geochemistry Database should only be done with the approval of the Geochemistry Database manager. In order to use LOADER the user requires the MS Access application *load_geochm.mdb* with ODBC (Open Database Connectivity) installed, including setting up an ORACLE data source called "kk". The user must have an ORACLE ID and password, and have select and insert ORACLE privileges on the Geochemistry Database tables and the copies of them in the ‘acma’ schema. Permissions to access directories in which files are located and MS Access permissions also have to be correctly set. This complexity of requirements will mean that an ORACLE and MS Access expert is required to set up the application on your PC before you can commence work.

Data are loaded from imported MS EXCEL files, one for field card data and one for chemical analyses. They do not need to be loaded at the same time, as analytical data does not require field card data to have been loaded to the database and vice versa. This account is concerned only with the loading of the field card data.

The LOADER application when run will first check to see if the sample site information has already been loaded. Only sample sites **not** previously loaded will be appended. The application cannot be used to modify existing records. Any existing data that needs replacing will have to be deleted from the Geochemistry Database first.

4.3.3 LOADER Design

The design of LOADER relies on a series of queries, run within a macro that load data to temporary tables in MS Access, and from here they are transferred to the Geochemistry Database after a series of checks. LOADER relies on a large number of predefined MS Access queries and hence requires the column names of data to be loaded which must be consistent with those expected by the query.

Within the application there are a number of procedures that are executed to convert or translate fields from the field database into correctly coded fields for the Geochemistry Database:

<u>Profile soil site number</u>. Historically G-BASE has numbered soils collected at a single location in a different way to the MRP numbered soils. According to the database design samples collected down an auger hole are not from the same site as although the x and y coordinates will be the same (for a vertical hole), the z (height) coordinate will be different. For logistical and quality control reasons it is far easier for G-BASE to assign a single site number to the A

(surface) and S (profile) soils. In order to comply with the Geochemistry Database design the profile (S) soils have to be renumbered when entered into the database. The LOADER program automatically adds 50 000 to the S sample site number. This soil site number renumbering should not be confused with the renumbering process described by Coats (2004) in which errors in MRP soil sample numbering required 10 000 to be added to some of the MRP soil numbers in order to maintain the uniqueness of site numbers.

Translation of G-BASE soil texture codes to Geochemistry Database texture codes. Soil textures in G-BASE are described by a series of simple codes listed in Table 5. The Geochemistry Database uses a different more complex system of codes and these are given in Appendix 1: (domain table **BGS_MTA_DOM_SOIL_TEXTURE**). The LOADER program translates the codes according to those listed in Table 15.

G_BASE TEXTURE	GEOCHEM_TEXTURE
CLAY	K
SAND	A
SASI	D
SILT	I
SICL	M
SISA	C
SACL	J

Table 15: Table showing code translations for soil texture

Translation of colour codes. G-BASE uses a very simple system of colour descriptions for the various types of sample media. Describing colour is a very complex process and is very subjective according to lighting conditions and "wetness" of sample. G-BASE sample descriptions only allow a few colours to be used in descriptions and these need to be translated into a Munsell colour code, which is actually made up of four components - hue, color, value and chroma. The translations applied in the LOADER program are listed in Table 16. The field database should not include any colours other than those listed.

G-BASE field	G-BASE colour code	MUNSELL_ HUE	MUNSELL_ COLOR	MUNSELL_ VALUE	MUNSELL_ CHROMA
Sed_colour	GY	0	N	5	0
	LB-O	10	YR	5	8
	DB-BL	10	YR	2	2
Wat_colour	BR	7.5	YR	5	3
	YE	5	Y	8	8
	CL	0	N	0	0
SoilA_colour & SoilS_colour	BL	0	N	2.5	0
	DB	7.5	YR	3	3
	LB	7.5	YR	6	3
	RE	10	R	5	8
	OR	10	YR	6	8
	YE	5	Y	8	8
	GR	5	G	6	2
	GY	0	N	5	0

Table 16: Table showing translation of G-BASE colours to Munsell colour codes

Abundances. The Geochemistry Database uses numbers to indicate relative abundance, 1 being more abundant than 2 which is more abundant than 3 and so on. G-BASE also uses the numbers 1, 2 and 3 to indicate abundance but 3 is used to indicate abundant/heavy whilst 1 indicates light/none. For the following fields the LOADER program reverses the G-BASE codes, ie.

replaces 1 with 3 and 3 with 1: PPT_orange, PPT_brown; PPT_black; Sed_clay; Sed_organic, Organic_A and Organic_S.

4.4 USING LOADER

Once the data has been reformatted into the format required for using LOADER (see section 4.2.3) the program can be used to load site and sample information to the database. On opening the MS Access application **(load_geochem.mdb**) an auto-run macro will present the user with an option screen like that shown in Figure 18. A help button is present to give the user guidance.

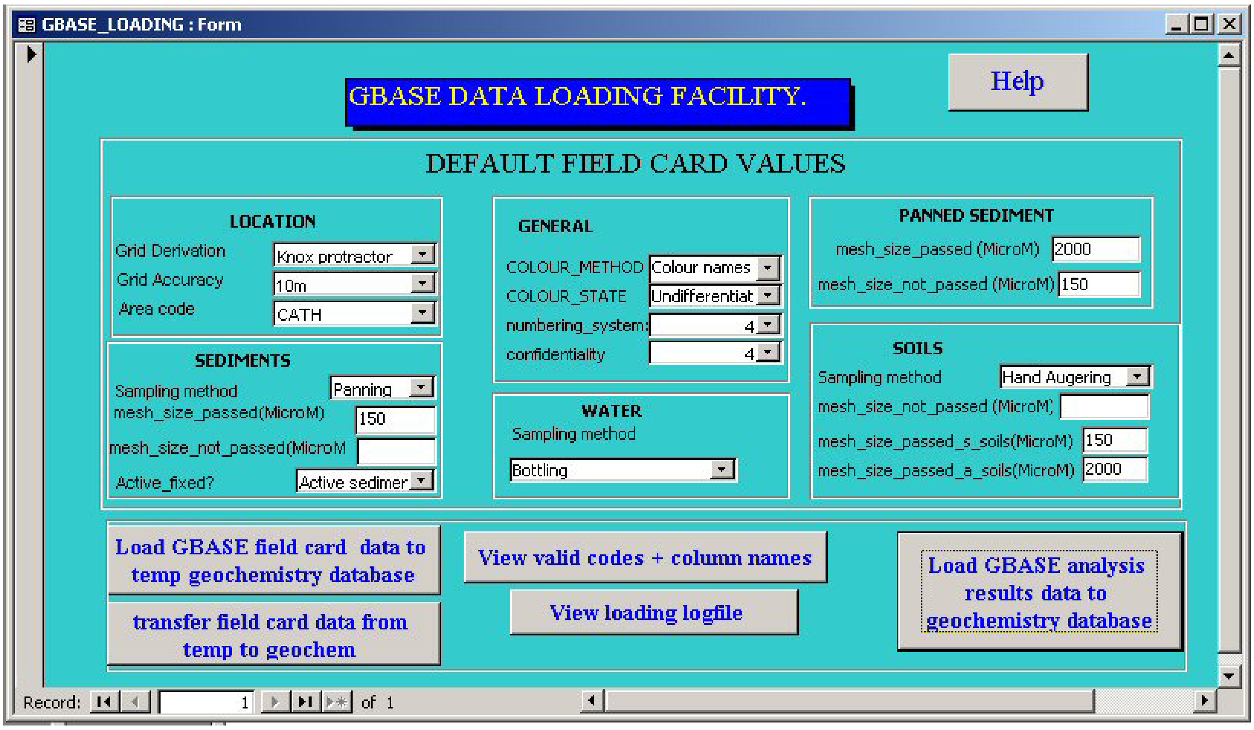


Figure 18: Opening option screen for the LOADER application

The user will be prompted for an ORACLE ID and password.

It can be noted from the screen that there are a number of implicit fields that are requested by the use of drop down lists. These should be completed for the sample media types that are being loaded. A summary of the field data names and the Geochemistry Database tables to which they are loaded to is given in Appendix 4:.

The first step is to import the field data into the MS Access application from an EXCEL file called field_data.xls that has the same columns as those given in Table 13. This is done by clicking the “Load GBASE field…..” button at which point the user will be prompted to give the path and filename for the field data to be imported. This must be a MS EXCEL file in the format described previously having correctly named column headings and residing in the same directory as the LOADER application. The minimum number of columns required are the **Project_code**, **Site_Number** and at least one of the sample type fields (i.e. **Samp_***).

Clicking the "Load G-BASE field card data….." button will then instigate a number of procedures. The records imported will be checked against existing data in the Geochemistry Database to see if data have already been loaded and basic tests on the data are done to make sure the minimum field information has been provided so loading does not break any integrity constraints (e.g. primary key duplication) in the dataset.

Data are transferred to a temporary, empty copy of the geochemistry database and LOADER then checks data values. LOADER only gives an error message to show the table, column and the code in the column that have errors but does not show which rows in the G-BASE data file are wrong. If errors are found during loading the data are not appended to the Geochemistry Database. The G-BASE data manager must correct errors in the MS EXCEL spreadsheet before resubmitting to the LOADER application.

Finally, by clicking on "transfer field card data from the temp…" button data are then appended to the main database. This stage would be done by the Database Manager.

Once all data has been loaded, a log is stored in the *loading_log* Access data table of how many rows were loaded to which table. This log is accessible from the main form.

4.5 FIELD DATA PREVIOUSLY LOADED

G-BASE field data that have been loaded between 1998 and 2004 are summarised in Appendix 5:. This information is derived from an ORACLE query.

Appendix 1: Important Geochemistry Database Domain definitions

SOIL TEXTURE

CODE	TRANSLATION	DEFINED_AS
A	Sand	Soil consisting mostly of coarse and fine sand, and containing so little clay that it is loose when dry and not sticky at all when wet. When rubbed it leaves no film on the fingers.
B	Loamy sand	Consisting mostly of sand but with sufficient clay to give slight plasticity and cohesion when very moist. Leaves a slight film of fine materials on the fingers when rubbed.
C	Sandy loam	Soil in which the sand fraction is still quite obvious, which moulds readily when sufficiently moist but in most cases does not stick appreciably to the fingers. Threads do not form easily.
D	Loam	Soil in which the fractions are so blended that it moulds readily when sufficiently moist, and sticks to the fingers to some extent. It can with difficulty be moulded into threads but will not bend into a small ring.
E	Silt loam	Soil that is moderately plastic without being very sticky, and in which the smooth soapy feel of the silt is the main feature.
F	Sandy clay loam	Soils containing sufficient clay to be distinctly sticky when moist, but in which the sand fraction is still an obvious feature.
G	Clay loam	The soil is distinctly sticky when sufficiently moist, and the presence of sand fractions can only be detected with care.
H	Silty clay loam	This contains quite subordinate amounts of sand, but sufficient silt to confer something of a smooth soapy feel. It is less sticky than silty clay or clay loam.
I	Silt	Soil in which the smooth, soapy feel of silt is dominant.
J	Sandy clay	The soil is plastic and sticky when moistened sufficiently, but the sand fraction is still an obvious feature. Clay and sand are dominant, and the intermediate grades of silt and very fine sand are less apparent.
K	Medium clay	The soil is plastic and sticky when moistened sufficiently and gives a polished surface on rubbing. When moist the soil can be rolled into threads. With care a small proportion of sand can be detected.
L	Heavy clay	Extremely sticky and plastic soil, capable of being moulded when moist into any shape and taking clear fingerprints.
M	Silty clay	Soil which is composed almost entirely of very fine material but in which the smooth soapy feel of the silt fraction modifies to some extent the stickiness of the of the clay.
N	Boulders	Most particles in the soil are boulders (>200 mm)
O	Cobbles	Most particles in the soil are <200 mm but >60 mm
P	Gravel	Most particles in the soil are <60 mm but >2 mm

Table 17: Domain table BGS_MTA_DOM_SOIL_TEXTURE - soil texture

SAMPLE TYPE

CODE	TRANSLATION	DEFINED_AS
A	G-BASE surface soils sample	G-BASE soil from standard depth of 5-20 cm
C	Stream Sediment	Stream Sediment
D	Drill core	Drill core.
E	Mineral	Mineral.
F	Float sediment (Fines)	Float sediment (Fines).
G	Gas	Gas.
H	Panned Rock	Panned Rock
J	Marine sediment	Marine sediment.
M	Drill mud (Sludge)	Drill mud (Sludge).
N	Panned sludge	Panned sludge.
P	Panned stream sediment	Panned stream sediment.
R	Rock	Rock.
S	Soil	Shallow overburden altered by soil forming processes.
T	Deep overburden	Deep overburden unaltered by soil forming processes (often a till in northern Britain).
U	Panned overburden or soil	Panned overburden or soil.
V	Vegetation	Vegetation.
W	Water	Water.
Z	Mine Waste	Tailings etc

Table 18: Domain table BGS_MTA_DOM_SAMPLE_TYPE - sample type

NUMBERING SYSTEM

CODE	TRANSLATION	DEFINED_AS
1	Min Pet	
2	Bio Strat	
3	MRP	Mineral Reconnaissance Programme
4	GBASE	Geochemical Baseline Survey of the Environment
5	Environmental surveys	

Table 19: Domain table BGS_MTA_DOM_NUMBERING_SYSTEM - sample numbering system code

CODE	TRANSLATION	DEFINED_AS
0	0	Code of pre 1970s Geochemical field card.
-1	mine waste card	
70.1	1970	Code , before translation into the database,compatable with the 1970.1 Geochemical field card.
70.2	1970	Code , before translation into the database,compatable with the 1970.2 Geochemical field card.
70.3	1970	Code , before translation into the database,compatable with the 1970.3 Geochemical field card.
71.1	1971	Code , before translation into the database,compatable with the 1971.1 Geochemical field card.
72.1	1972	Code , before translation into the database,compatable with the 1972.1 Geochemical field card.
74.1	1974	Code , before translation into the database,compatable with the 1974.1 Geochemical field card.
75.1	1975	Code , before translation into the database,compatable with the 1975.1 Geochemical field card.
76.1	1976	Code , before translation into the database,compatable with the 1976.1 Geochemical field card.
81.1	1981RGRP drainage	Code , before translation into the database,compatable with the 1981.1 Geochemical field card. Used for RGRP drainage & soil until 1991. Ref Lister et al 2005; Harris et al, 1992
87.1	1987	Code , before translation into the database,compatable with the 1987.1 Geochemical field card.
88.1	1988	Code , before translation into the database,compatable with the 1988.1 Geochemical field card.
89.1	1989	Code , before translation into the database,compatable with the 1989.1 Geochemical field card.
90.1	1990	Code , before translation into the database,compatable with the 1990.1 Geochemical field card.
90.2	1990	Code , before translation into the database,compatable with the 1990.2 Geochemical field card.
90.3	1990	Code , before translation into the database,compatable with the 1990.3 Geochemical field card.
90.4	1990	Code , before translation into the database,compatable with the 1990.4 Geochemical field card.
91.1	1991GSP Drainage/soil	Code , before translation into the database,compatable with the 1991.1 Geochemical field card. Ref: Harris et al, 1992; Lister et al 2005
91.2	1991	Code , before translation into the database,compatable with the 1991.2 Geochemical field card.
91.5	1991	Code , before translation into the database, was compatable with the 1991.5 Geochemical field card.
94.1	1994 GSP urban soil/water	Code, before translation into the database,compatable with the 1994.1 Geochemical field card. Ref: Lister et al 2005
95.1	1995 GSP urban soil/water	Code, before translation into the database,compatable with the 1995.1Geochemical field card. Ref: Lister et al 2005
2001.1	2001 GBASE urban soil	Code, before translation into the database,compatable with the 2001.1 Geochemical field card. Ref: Lister et al, 2005;
2003.1	2003 GBASE regional drainage	Code, before translation into the database,compatable with the 2003.1 Geochemical field card. Ref: Lister et al 2005;
2003.2	2003 GBASE regional soil	Code, before translation into the database,compatable with the 2003.2 Geochemical field card. Ref: Lister et al 2005;
2005.1	2005 GBASE urban/regional soil	Code , before translation into the database,compatable with the 2005.1 Geochemical field card. Ref: Lister et al 2005; Johnson, 2005
2005.2	2005 GBASE regional drainage	Code , before translation into the database,compatable with the 2005.2 Geochemical field card. Ref: Lister et al 2005; Johnson, 2005

Table 20: Domain table BGS_MTA_DOM_CODE_VERSION - field card version codes

Appendix 2: MS Access Code for data entry forms

DRAINAGE

Form_Sedi2005 (Code)

```
Option Compare Database 'use database order for comparisons
Private Sub Dupsite_Enter()
If Me![Sitenumber] = 9999 Then
GoTo Duffnumber
Else
GoTo Skipduff
End If

Duffnumber:
MsgBox "Site Number is entered as default. Please enter new Site Number"
Me![Sitenumber].SetFocus

Skipduff:
End Sub
Private Sub Form_Load()
'set the duplicate field number box to be invisible'

        Me![Dup_sample].Visible = False

End Sub
Private Sub Dupsite_AfterUpdate()
    If Me![Dupsite] = True Then
    Me![Dup_sample].Visible = True
    Me![Dup_sample].SetFocus
    End If
    If Me![Dupsite] = False Then
    Me![Dup_sample].Visible = False
    Me![Dup_sample].Value = Me![Dup_sample].DefaultValue
    End If

End Sub
Private Sub Form_Open(Cancel As Integer)
DoCmd.GoToRecord A_FORM, "sedi2004", A_NEWREC

End Sub
```

```
Private Sub northbox_Enter()
If Me![Eastbox] < 530000 Or Me![Eastbox] > 655000 Then
GoTo Duffeast
Else
GoTo Skipeast
End If

Duffeast:
MsgBox "Easting is outwith acceptable range. Please re-enter"
Me![Eastbox].SetFocus

Skipeast:

End Sub

Private Sub refmap_Enter()

If Me![Northbox] < 260000 Or Me![Northbox] > 300000 Then
GoTo Duffnorth
Else
GoTo Skipnorth
End If

Duffnorth:
MsgBox "Northing is outwith acceptable range. Please re-enter"
Me![Northbox].SetFocus

Skipnorth:
End Sub

Private Sub refmap_GotFocus()
SendKeys "^(')", True
End Sub
Private Sub sampdate_GotFocus()
SendKeys "^(')", True
End Sub
Private Sub project_code_GotFocus()
SendKeys "^(')", True
End Sub
Private Sub Command230_Click()
On Error GoTo Err_Command230_Click
```

```
    DoCmd.Close
Exit_Command230_Click:
    Exit Sub
Err_Command230_Click:
    MsgBox Err.Description
    Resume Exit_Command230_Click

End Sub
Private Sub Gonextbutton_Click()

On Error GoTo ErrHandler
DoCmd.GoToRecord , , acNext
Me![projectcode].SetFocus

GoTo SkipHandler
ErrHandler:
MsgBox "This Site Number already exists in the database. Please verify and re-enter"
Err.Clear
Me![Sitenumber].SetFocus

SkipHandler:
Exit_Gonextbutton_Click:

    Exit Sub
On Error Resume Next
End Sub
```

SOIL

Form_Soil2005 (Code)

```
Option Compare Database
Option Explicit

Private Sub Dupsite_Enter()
If Me![Sitenumber] = 9999 Then
GoTo Duffnumber
Else
GoTo Skipduff
End If
Duffnumber:
MsgBox "Site Number is entered as default. Please enter new Site Number"
Me![Sitenumber].SetFocus
```

```
Skipduff:
End Sub
Private Sub Exitsoilform_Click()
On Error GoTo Err_Command230_Click
    DoCmd.Close
Exit_Command230_Click:
    Exit Sub
Err_Command230_Click:
    MsgBox Err.Description
    Resume Exit_Command230_Click
End Sub
Private Sub Form_Load()
'set the duplicate field number box to be invisible'

        Me![Dup_sample].Visible = False
End Sub
Private Sub Dupsite_AfterUpdate()
    If Me![Dupsite] = True Then
    Me![Dup_sample].Visible = True
    Me![Dup_sample].SetFocus
    End If
    If Me![Dupsite] = False Then
    Me![Dup_sample].Visible = False
    Me![Dup_sample].Value = Me![Dup_sample].DefaultValue
    End If

End Sub
Private Sub Form_Open(Cancel As Integer)
DoCmd.GoToRecord A_FORM, "soil2004", A_NEWREC

End Sub
Private Sub Gonextbutton_Click()
On Error GoTo ErrHandler
DoCmd.GoToRecord , , acNext
Me![projectcode].SetFocus

GoTo SkipHandler
ErrHandler:
MsgBox "This Site Number already exists in the database. Please verify and
re-enter"
Err.Clear
Me![Sitenumber].SetFocus
SkipHandler:
```

```
Exit_Gonextbutton_Click:
Exit Sub
    On Error Resume Next

End Sub
Private Sub northbox_Enter()

If Me![Eastbox] < 530000 Or Me![Eastbox] > 655000 Then
GoTo Duffeast
Else
GoTo Skipeast
End If

Duffeast:
MsgBox "Easting is outwith acceptable range. Please re-enter"
Me![Eastbox].SetFocus

Skipeast:

End Sub
Private Sub refmap_Enter()
If Me![Northbox] < 260000 Or Me![Northbox] > 300000 Then
GoTo Duffnorth
Else
GoTo Skipnorth
End If

Duffnorth:
MsgBox "Northing is outwith acceptable range. Please re-enter"
Me![Northbox].SetFocus
Skipnorth:
End Sub
Private Sub refmap_GotFocus()
SendKeys "^(')", True
End Sub

Private Sub sampdate_GotFocus()
SendKeys "^(')", True
End Sub
Private Sub project_code_GotFocus()
SendKeys "^(')", True
End Sub
```

Appendix 3: Example retrievals from the Geochemistry Database using field card information

The Geochemistry Database has many ORACLE tables with similar fields and many tables that contain the same fields. A user unfamiliar to the Geochemistry Database will need to ask the question "where do I find …..?". The first example shows how to download analytical results. Subsequent examples show how field database information can be used in selective criteria. The discussions below assume the user has the skills to construct a Query in MS Access.

1. How do I retrieve all the G-BASE stream sediment samples with Easting, Northing, and analytical results for the Lake District Atlas area?

a) Firstly create a query in MS Access to down load the stream sediment data from the G-BASE project for the Lake District atlas area. This is shown in Figure 19. The BGS.DTA_DRAINAGE_SITES and BGS.DTA_ANALYTE_DETERMINATIONS tables are linked and the following selection criteria applied: NUMBERING_SYSTEM = 4 (for G-BASE samples); SAMPLE_TYPE = "C" for stream sediments; and ATLAS = "LAKE" for Lake District. The results are given in Table 21.

NUMBERING_SYSTEM	PROJECT	SITENO	SAMPLE_TYPE	ATLAS	EASTING	NORTHING	METHOD	ANALYTE	ABUNDANCE	QUALIFIER
4	30	208	C	LAKE	399100	565670	DCOES	Ag	0	
4	30	208	C	LAKE	399100	565670	DCOES	Al	53534.8	
4	30	208	C	LAKE	399100	565670	DCOES	B	49	
4	30	208	C	LAKE	399100	565670	DCOES	Ba	615.402	
4	30	208	C	LAKE	399100	565670	DCOES	Be	1.3	
4	30	208	C	LAKE	399100	565670	DCOES	Bi	0	
4	30	208	C	LAKE	399100	565670	DCOES	Ca	32215.74278	
4	30	208	C	LAKE	399100	565670	DCOES	Cd	0.4	
4	30	208	C	LAKE	399100	565670	DCOES	Ce	0	
4	30	208	C	LAKE	399100	565670	DCOES	Co	28.0751	
4	30	208	C	LAKE	399100	565670	DCOES	Cr	151.0051	
4	30	208	C	LAKE	399100	565670	DCOES	Cu	14.4361	
4	30	208	C	LAKE	399100	565670	DCOES	Fe	31629.05705	
4	30	208	C	LAKE	399100	565670	DCOES	Ga	9.00854	
4	30	208	C	LAKE	399100	565670	DCOES	K	14446.31364	

Table 21: Listing of results produced by the select query in example 1

b) This query produces a very large data table listing each analyte (element) determination for each site on a separate row. An example of the first few records is given above. Note that a sample may have been determined by several different methods. The abundances are not yet rounded to a sensible number of decimal places as original data have been levelled by a correction factor in the database. There is also a "qualifier" field which should contain information about the 'correctness' of the abundance value, e.g. < to indicate less than detection. This field has not been utilised much in the past but will be populated following a recent audit of the database which highlighted the problem of listing less than detection values as 0. In order to produce a more readable table, samples should be represented by a single row with column headings. This can be done by using a 'Crosstab Query' based on the 'Select Query' used above.

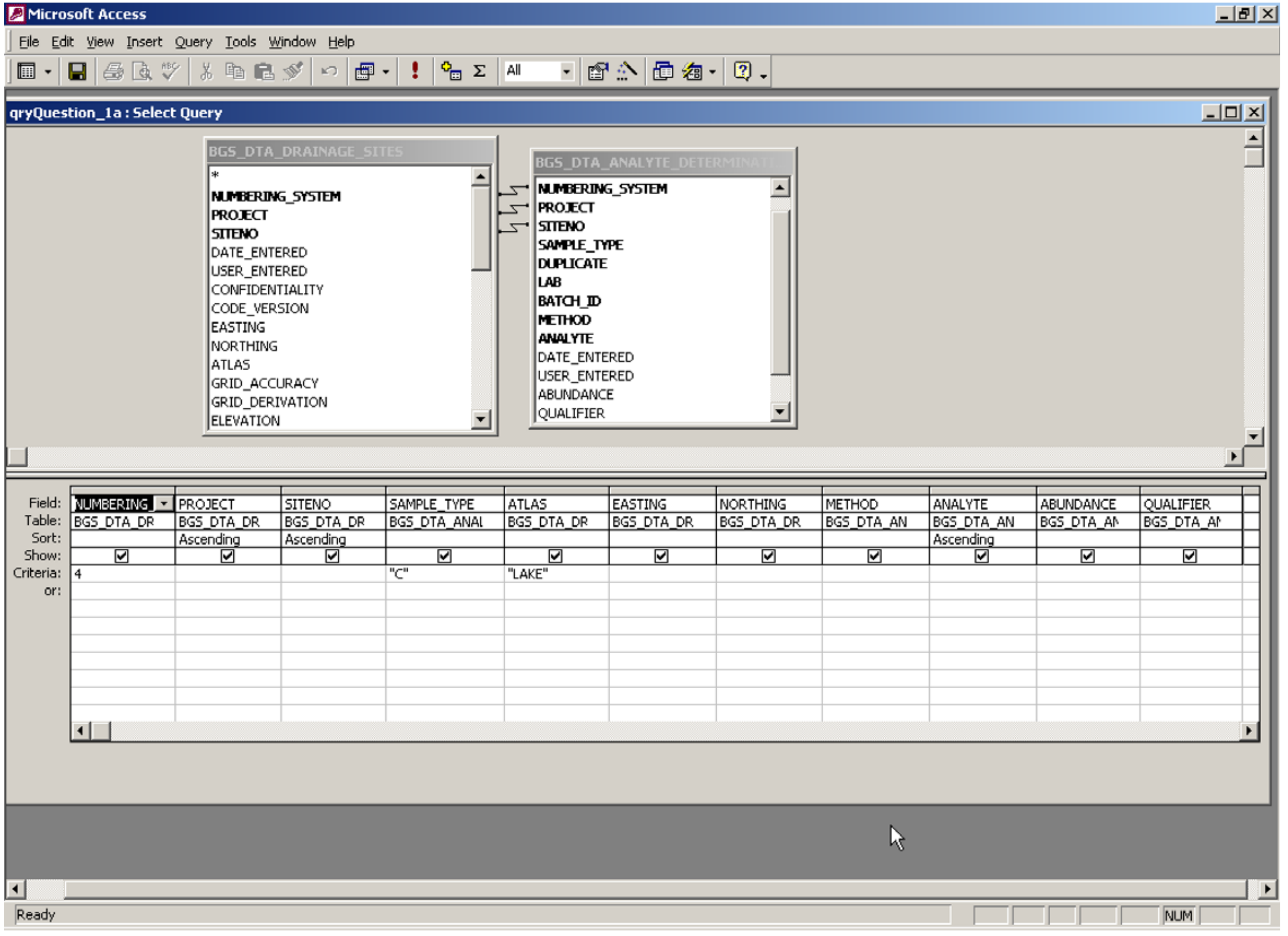


Figure 19: Example 1 - query to download analyte data for G-BASE Lake District stream sediments

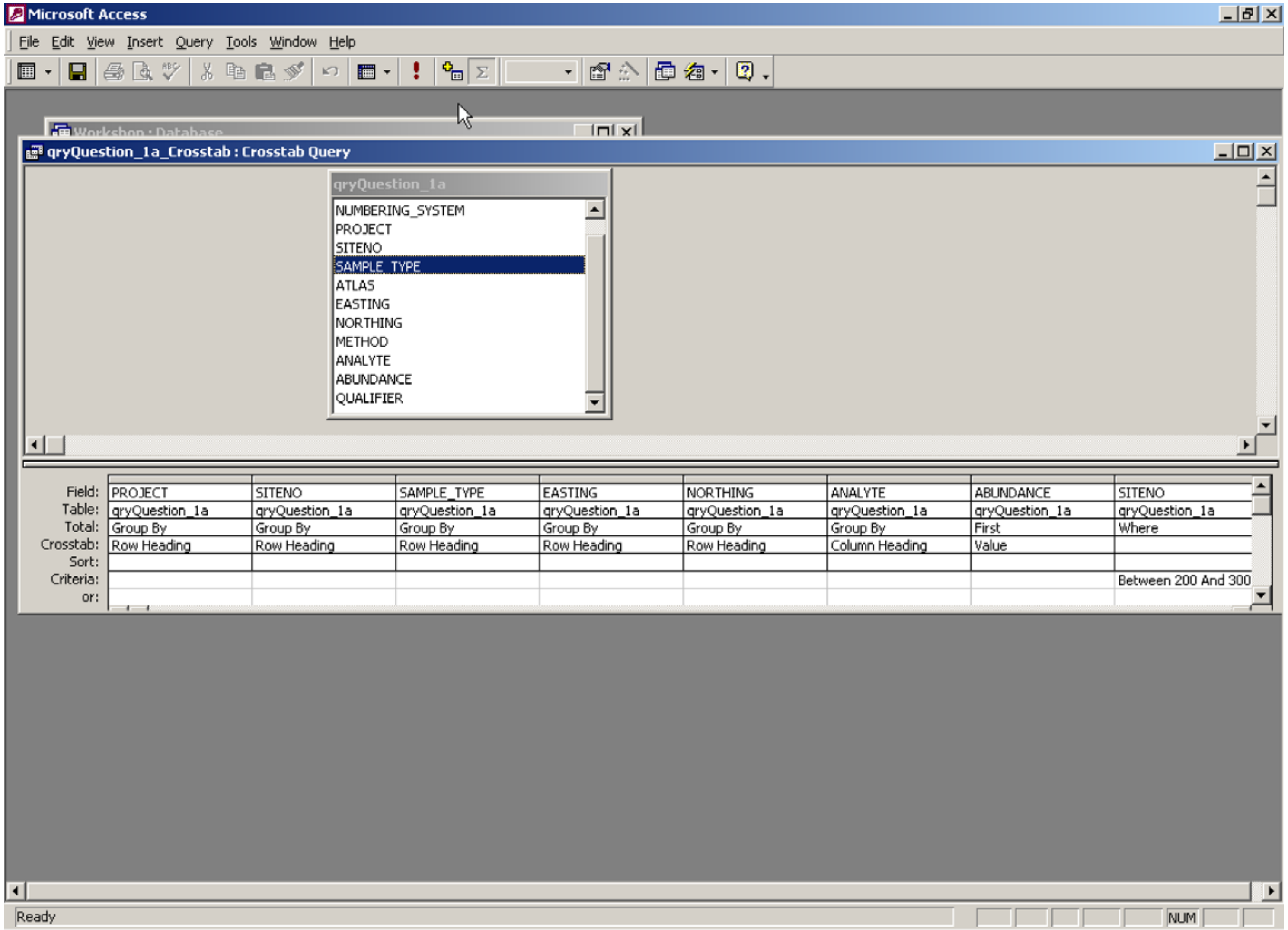


Figure 20: Example 1 - Crosstab Query using the Select Query created in the first part of the example

c) To create the Crosstab query select 'create a query in design view" and add the query created in step one to the top window and create the query as shown in Figure 20. An example of part of the selected data is listed below in Table 22 (exported to Excel). Note that element concentrations (all listed in mg/kg) have not yet been formatted to the correct number of decimal places. Elements usually quoted in G-BASE as percentage oxide (e.g. Al and Ca) will need converting to oxide concentrations. Conversion factors for commonly used oxides are given in Table 23.

PROJEC	SITENO	PLE_T	EASTING	NORTHING	Ag	Al	As	B	Ba	Be	Bi	Ca
30	208	C	399100	565670	0	53534.8		49	615.402	1.3	0	32215.74278
32	201	C	377940	540650	0	197951.8	10	66	351.9972	2.2	0	2117.145713
32	202	C	367210	555340	0	102414.41		80	648.1124	1.7	0	2117.145713
32	203	C	368030	546050	0	88924.9	10	88	1002.762	2.2	0	3183.814022
32	204	C	375370	535770	1.5	96806.99		104	330.4772	3.1	0.5	12180.92932
32	205	C	375910	536300	0.2	64802.5	20	96	408.81	2.9	1	15334.55737
32	207	C	376780	533270	0	73213.6	5	71	345.9716	1.5	0	2117.145713
32	208	C	367120	544520	0	95114.2		66	646.3908	2.4	0	4250.482331
32	209	C	378110	541530	0.8	71520.8	20	64	264.1956	2.1	0	2673.668309
32	210	C	373310	550520	0	80513.8	15	78	777.2324	2	0	3183.814022
32	211	C	367330	544910	0	108021.8	10	63	463.0404	1.9	0	2673.668309
32	212	C	368690	546590	0	68135.2		69	828.8804	2.2	0	6337.442066
32	213	C	368900	546700	0	59142.2	15	64	711.8116	2.3	0.5	6893.964662

Table 22: Listing of part of the results produced by the crosstab query of Example 1

Element	Oxide	Conversion Factor
Al	Al2O3	1.889
Ca	CaO	1.399
Fe	Fe2O3	1.430
K	K2O	1.205
Mg	MgO	1.658
Mn	MnO	1.291
Na	Na2O	1.348
P	P2O5	2.291
Ti	TiO2	1.668

Table 23: Table of the most commonly used oxide conversion factors

2. How do I select G-BASE samples?

Use the field NUMBERING_SYSTEM which can be found in the site tables (BGS_DTA_ DRAINAGE_SITES, BGS_DTA_NORMAL_SITES, or BORE_SITES). The codes for the numbering system are found in the domain table BGS_MTA_DOM_NUMBERING_SYSTEM (see Appendix 1:) and for G-BASE the code is 4.

3. How do I know if the data I want to assess are confidential?

There is a field called CONFIDENTIALITY which is defined in the domain table BGS_MTA_DOM_CONFIDENTIALITY and is found in the sites tables listed above and the BGS_DTA_ BATCHES table. Confidential data are coded with a 4 or 5 in this field. These codes are somewhat outdated and would not fit within the current BGS IPR scheme. A review of geochemistry data confidentiality is recommended. The default value, if assigned, is usually 4 (confidential). Any doubts about data confidentially should be referred to the Geochemistry Database Manager.

4. How do I select a particular type of sample?

The sample type is defined as a single character code and keyfield SAMPLE_TYPE in the BGS_DTA_ANALYTE_DETERMINATIONS, BGS_DTA_PROJECT_BATCHES, and several other data tables and is defined by the domain table BGS_MTA_DOM_ SAMPLE_TYPE. Retrieval is usually done on the BGS_DTA_ ANALYTE_DETERMINATIONS table as shown in the example in example 1.

5. How do I select data for a specified geographical area?

The EASTING and NORTHING fields of the site tables are used for retrieval where the full metre grid reference should be used. For polygon areas ArcView can be employed to select samples from predefined polygonal areas such as local authority or lithological boundaries. If the geographical area corresponds to a geochemical atlas area then the "atlas" field from BGS.DTA_DRAINAGE_SITES can be used for retrieval.

6. When I download analytical results why do I get several different analyses for the same sample

Some of the samples loaded in the Geochemistry Database may have been analysed by several different analytical methods and if you do not specify a particular method then results for all methods will be retrieved. It is necessary, if this is the case, to specify a selection criteria for the method used. The METHOD is a keyfield in the BGS_DTA_ ANALYTE_DETERMINATIONS table and codes are defined in the BGS_MTA_DOM_ANALYSIS_METHOD table. For example, if only analyses done by optical emission spectroscopy are required then the code "OES" in the METHOD field should be used for retrieval.

7. Where do I find sample pH?

For waters this is considered as a property and can be found in the PH field of the BGS_DTA_ WATERS table along with conductivity and other water properties. Unfortunately, there is no way of indicating in the database how the pH determination was done (e.g. on site with pH stick or in fieldbase with pH meter). Soil pH results can be found in the BGS_DTA_ OVERBURDENS table where it is listed as a property. Loss-on-ignition, which for G-BASE samples is requested at the same time as soil pH determinations, is considered as a method ("LOI450") and is found in the BGS_DTA_ ANALYTE_DETERMINATIONS table.

8. How do I retrieve samples associated with a particular land use?

Land use is information entered on geochemistry field slips and this would generally be more accurate and up-to-date than land use maps that may be available. LANDUSE is a field in found in the BGS_DTA_ LANDUSE database table and defined in the domain table BGS_MTA_DOM_ LANDUSE. Land use codes are hierarchical so "wildcard" characters can be used to search for more general grouping. For example, to list all surface soils from G-BASE associated with woodlands (which may be classified as deciduous, mixed, coniferous etc.) use "A*" as criteria for land use. The query for this example is shown in Figure 21.

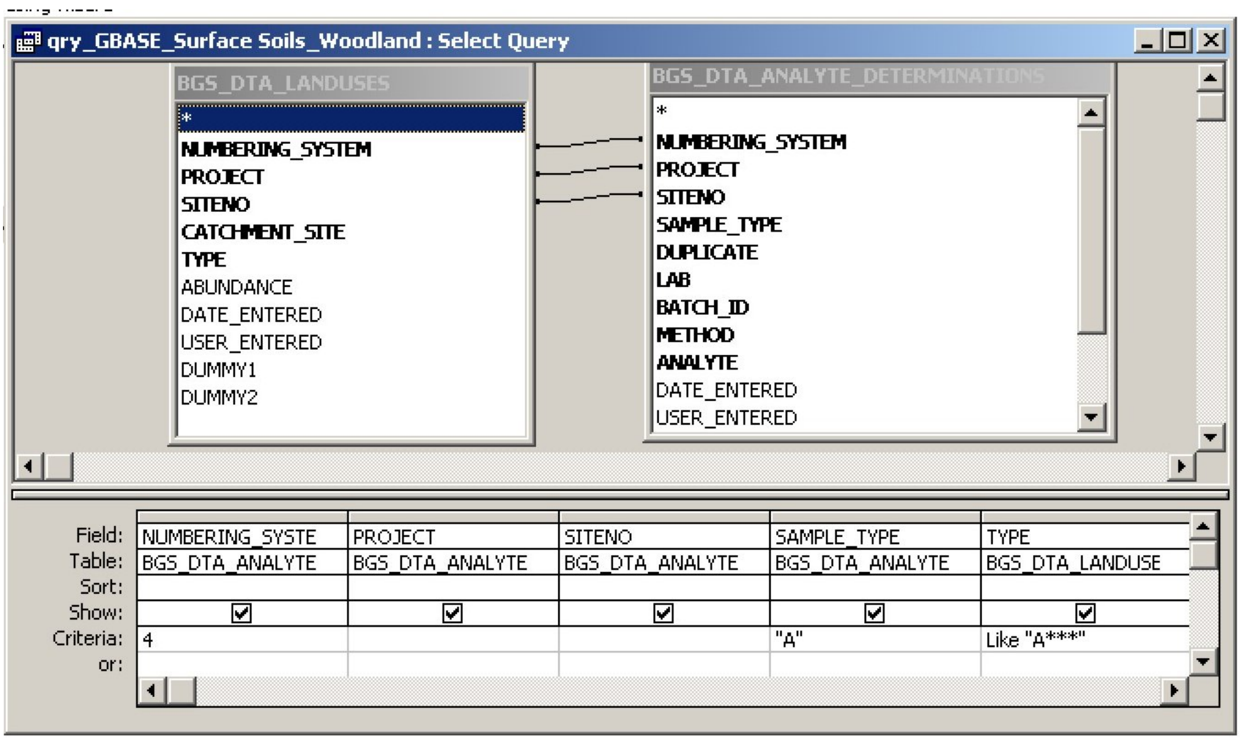


Figure 21: Example of a land use query using 'wildcard' characters

9. How do I retrieve samples associated with contamination?

Twenty columns are available on the G-BASE field cards to record site contamination which becomes nine fields of coded information (often supported by free text comments in the field database). In the Geochemistry Database codes are translated to conform with entries in the domain table BGS_MTA_DOM_ CONTAMINANT. A simple select query on the BGS_DTA_ CONTAMINANTS table can identify the samples of a particular sample type that are associated with contamination (use 'Is not null' in the contaminant field). A crosstab query is needed to list on a single row all the different contamination associated with a particular sample.

10. How do I retrieve samples associated with a particular lithology?

Geochemical sample field forms record the geology at site and of the catchment area. This is recorded by student collectors who would usually take the geology from the published geological map. Classifying drainage or overburden samples by a lithological code is probably best done using the Arc GIS interface to the Geochemistry Database and using GIS functionality to intersect sample sites with the BGS digital geology map polygons.

11. How do I get a list of samples collected by a particular sampler?

The sample collector is a field (COLLECTOR) in the BGS_DTA_ DRAINAGE_SITES and BGS_DTA_ NORMAL_SITES tables. Sampling is usually done in pairs and the samplers initials are entered in the COLLECTOR field, i.e. there is usually more than one person identified in this field. For example, to select all the samples collected by CCJ, then the select criteria should be "*CCJ*". Note that it is standard G-BASE procedure for the form filler's initials to be recorded first and the collector's initials second. From 2003 onwards sampler IDs are recorded in the annual field campaign report.

Appendix 4: Field card to Database translations

Field Card fields for transfer to GD	Data Type	Loading Size	GD column name and conditional arguments	GD tables fields are loaded to
Project_Code	Text	3	PROJECT	ALL TABLES THAT HAVE A 'PROJECT' COLUMN
Site_Number	Integer	16	SITENO	ALL TABLES THAT HAVE A 'SITENO' COLUMN
Sampling_Protocol	Text	5	SAMPLING_PROTOCOL	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Code_Version	Number	6,2	CODE_VERSION	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Duplicate			None	
Samp_C	Text	1	SAMPLE_TYPE	DTA_SEDIMENTS
Samp_P	Text	1	SAMPLE_TYPE	DTA_PANS
Samp_W	Text	1	SAMPLE_TYPE	DTA_WATERS
Samp_A	Text	1	SAMPLE_TYPE	DTA_OVERBURDENS
Samp_S	Text	1	SAMPLE_TYPE	DTA_OVERBURDENS
Samp_Std	Text	4	SAMP_STD	DTA_SEDIMENTS, DTA_WATERS, DTA_OVERBURDENS
Easting	Double	8	Easting	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Northing	Double	8	Northing	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Ref_map	Double	8	MAP_SHEET	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Map_Scale	Integer	5	MAP_SCALE	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Collectors	Text	100	Collectors	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Date	Date/Time	8	DATE_VISITED	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Rel_Samp	Integer	5	REL_SAMP	DTA_SEDIMENTS, DTA_WATERS, DTA_OVERBURDENS
Stm_order	Integer	2	STREAM_ORDER	DTA_DRAINAGE_SITES
Drain_type	Integer	4	DRAINAGE_TYPE	DTA_DRAINAGE_SITES
Drain_cond	Integer	4	DRAINAGE_CONDITION	DTA_DRAINAGE_SITES
Weather	Integer	4	WEATHER	DTA_DRAINAGE_SITES
PPT_orange	Integer	4	COLOUR (as 'OR'), abundance if ([ppt_orange]=3,1,[ppt_orange]=1,3)	DTA_SEDIMENT_PPT
PPT_brown	Integer	4	COLOUR (as 'BR'), abundance if ([ppt_brown]=3,1,[ppt_brown]=1,3)	DTA_SEDIMENT_PPT
PPT_black	Integer	4	COLOUR (as 'BK'), abundance if ([ppt_black]=3,1,[ppt_black]=1,3)	DTA_SEDIMENT_PPT
Sed_colour	Text	5	Munsell Colour Columns	DTA_SEDIMENTS
Sed_clay	Text	5	CLAY . abundance= if([SED_CLAY]=3,1,[SED_CLAY]=1,3)	DTA_SEDIMENTS
Sed_organic	Text	5	ORGANIC abundance= if([SED_ORGANIC]=3,1,[SED_ORGANIC]=1,3)	DTA_SEDIMENTS
Contam1	Text	6	CONTAMINANT relative abundance 1	DTA_SITE_CONTAMINANTS
Contam2	Text	6	CONTAMINANT relative abundance 2	DTA_SITE_CONTAMINANTS
Contam3	Text	6	CONTAMINANT relative abundance 3	DTA_SITE_CONTAMINANTS
Contam4	Text	6	CONTAMINANT relative abundance 4	DTA_SITE_CONTAMINANTS
Contam5	Text	6	CONTAMINANT relative abundance 5	DTA_SITE_CONTAMINANTS
Contam6	Text	6	CONTAMINANT relative abundance 6	DTA_SITE_CONTAMINANTS
Contam7	Text	6	CONTAMINANT relative abundance 7	DTA_SITE_CONTAMINANTS
Contam8	Text	6	CONTAMINANT relative abundance 8	DTA_SITE_CONTAMINANTS
Contam9	Text	6	CONTAMINANT relative abundance 9	DTA_SITE_CONTAMINANTS
Land_use1	Text	6	TYPE . sets catchment_site='S', abundance=1	DTA_LANDUSES
Land_use2	Text	6	TYPE . sets catchment_site='S', abundance=2	DTA_LANDUSES
Land_use3	Text	6	TYPE . sets catchment_site='S', abundance=3	DTA_LANDUSES
Clast1	Text	6	TYPE. sets abundance=1	DTA_CLASTS
Clast2	Text	6	TYPE. sets abundance=2	DTA_CLASTS
Clast3	Text	6	TYPE. sets abundance=3	DTA_CLASTS
Clast4	Text	6	TYPE. sets abundance=4	DTA_CLASTS
Clast5	Text	6	TYPE. sets abundance=5	DTA_CLASTS
Clast6	Text	6	TYPE. sets abundance=6	DTA_CLASTS
Clast7	Text	6	TYPE. sets abundance=7	DTA_CLASTS
Clast8	Text	6	TYPE. sets abundance=8	DTA_CLASTS
Bedrock	Text	6	VISIBLE_BEDROCK	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Drift1	Text	255	TYPE. sets abundance=1 catchment_site='S'	DTA_DRIFTS
Drift2	Text	6	TYPE. sets abundance=2 catchment_site='S'	DTA_DRIFTS
Drift3	Text	6	TYPE. sets abundance=3 catchment_site='S'	DTA_DRIFTS
Drift4	Text	6	TYPE. sets abundance=4 catchment_site='S'	DTA_DRIFTS
Relief	Integer	1	RELIEF	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES
Site_geol1	Text	6	TYPE. sets abundance=1 catchment_site='S'	DTA_GEOLOGYS
Site_geol2	Text	6	TYPE. sets abundance=2 catchment_site='S'	DTA_GEOLOGYS
Cat_geol1	Text	6	TYPE. sets abundance=1 catchment_site='C'	DTA_GEOLOGYS
Cat_geol2	Text	6	TYPE. sets abundance=2 catchment_site='C'	DTA_GEOLOGYS
Pan_min1	Text	6	TYPE. sets abundance=1	DTA_MINERALS #
Pan_min2	Text	6	TYPE. sets abundance=2	DTA_MINERALS #
Pan_min3	Text	6	TYPE. sets abundance=3	DTA_MINERALS #
Pan_min4	Text	6	TYPE. sets abundance=4	DTA_MINERALS #
Pan_min5	Text	6	TYPE. sets abundance=5	DTA_MINERALS #
Pan_min6	Text	6	TYPE. sets abundance=6	DTA_MINERALS #
Min_bed1	Text	6	TYPE. sets abundance=1	DTA_BEDROCK_MINERALISATION
Min_bed2	Text	6	TYPE. sets abundance=2	DTA_BEDROCK_MINERALISATION
Min_bed3	Text	6	TYPE. sets abundance=3	DTA_BEDROCK_MINERALISATION
Min_clast1	Text	6	TYPE. sets abundance=1	DTA_CLASTS_MINERALISATION
Min_clast2	Text	6	TYPE. sets abundance=2	DTA_CLASTS_MINERALISATION
Min_clast3	Text	6	TYPE. sets abundance=3	DTA_CLASTS_MINERALISATION
Minbed_Style	Text	1	MINERALISATION_STYLE Default = 0 (undifferientated)	DTA_BEDROCK_MINERALISATION
Wat_colour	Text	6	Munsell Colour Columns	DTA_WATERS
Susp_solid	Text	6	SUSPENDED_SOLIDS	DTA_WATERS
SoilA_colour	Text	6	Munsell Colour Columns	DTA_OVERBURDENS

Field Card fields for transfer to GD	Data Type	Loading Size	GD column name and conditional arguments	GD tables fields are loaded to
SoilS_colour	Text	6	Munsell Colour Columns	DTA_OVERBURDENS
SoilA_text	Text	6	TEXTURE	DTA_HORIZONS
SoilS_text	Text	6	TEXTURE	DTA_HORIZONS
Depth_A	Text	6	BOTTOM_DEPTH*	DTA_NORMAL_SITES
Depth_S	Text	6	BOTTOM_DEPTH*	DTA_NORMAL_SITES
Organic_A	Number	1	ORGANIC_CONTENT	DTA_OVERBURDENS
Organic_S	Number	1	ORGANIC_CONTENT	DTA_OVERBURDENS
A_clast1	Text	6	TYPE. sets abundance=1	DTA_CLASTS
A_clast2	Text	6	TYPE. sets abundance=2	DTA_CLASTS
A_clast3	Text	6	TYPE. sets abundance=3	DTA_CLASTS
A_clast4	Text	6	TYPE. sets abundance=4	DTA_CLASTS
A_clast5	Text	6	TYPE. sets abundance=5	DTA_CLASTS
A_clast6	Text	6	TYPE. sets abundance=6	DTA_CLASTS
S_clast1	Text	6	TYPE. sets abundance=1	DTA_CLASTS
S_clast2	Text	6	TYPE. sets abundance=2	DTA_CLASTS
S_clast3	Text	6	TYPE. sets abundance=3	DTA_CLASTS
S_clast4	Text	6	TYPE. sets abundance=4	DTA_CLASTS
S_clast5	Text	6	TYPE. sets abundance=5	DTA_CLASTS
S_clast6	Text	6	TYPE. sets abundance=6	DTA_CLASTS
A_moist	Text	6	SOIL_MOISTURE	DTA_OVERBURDENS
S_moist	Text	6	SOIL_MOISTURE	DTA_OVERBURDENS
Ph@	Number	6,2	PH (recorded to 1 dec place e.g. 7.2)	DTA_WATERS
Conduct@	Number	5	Conduct	DTA_WATERS
Bicarb	Double	8	BICARBONATE	DTA_WATERS
Comments	Text	255	COMMENTS	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES

$ = Default from loading screen
# = where samp_p is not null
@=entered in field database but not on field card
~ = duplicate is indicated by 1,2,3 etc non duplicates as +
* Top_depth is derived by subtracting 0.15m

Implicit fields entered during loading program

Field Card fields for transfer to GD	GD column name	GD tables fields are loaded to	Default
NUMBERING_SYSTEM	*NUMBERING_SYSTEM*	ALL TABLES THAT HAVE A NUMBERING_SYSTEM COL	4
COLOUR_METHOD	*COLOUR_METHOD*	DTA_SEDIMENTS	
SAMPLING_METHOD	*SAMPLING_METHOD*	DTA_SEDIMENTS,DTA_WATERS,DTA_OVERBURDENS	
MESH_SIZE_PASSED	*MESH_SIZE_PASSED*	DTA_OVERBURDENS	
MESH_SIZE_NOT_PASSED	*MESH_SIZE_NOT_PASSED*	DTA_OVERBURDENS	
GRID_DERIVATION	*GRID_DERIVATION*	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES	
GRID_ACCURACY	*GRID_ACCURACY*	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES	
ATLAS	*ATLAS*	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES	
ACTIVE_FIXED	*ACTIVE_FIXED*	DTA_SEDIMENTS	
COLOUR_STATE	*COLOUR_STATE*	DTA_SEDIMENTS,DTA_WATERS,DTA_OVERBURDENS	
HORIZON_type	*TYPE*	DTA_HORIZONS	U
CONFIDENTIALITY	*CONFIDENTIALITY*	DTA_NORMAL_SITES,DTA_DRAINAGE_SITES	4

Appendix 5: Summary of field data loaded to the Geochemistry Database between 1998 and 2004

ATLAS	INFO TYPE	COUNT_ROWS
ARGL	drainage sites	10328
BORD	drainage landuses	8187
BORD	drainage minerals	81
BORD	drainage sites	11118
CARD	soil contaminants	1222
CARD	soil clasts	1603
CARD	soil drifts	821
CARD	soil geologys	821
CARD	soil horizons	821
CARD	soil landuses	1181
CARD	soil landuses	1222
CARD	soil sites	821
CATH	drainage sites	1007
CLYD	drainage minerals	44
CLYD	drainage sites	8327
CORB	soil contaminants	17
CORB	soil clasts	574
CORB	soil drifts	208
CORB	soil geologys	160
CORB	soil landuses	17
CORB	soil landuses	140
CORB	soil sites	268
DERB	soil contaminants	615
DERB	soil clasts	1144
DERB	soil drifts	516
DERB	soil geologys	552
DERB	soil horizons	828
DERB	soil landuses	282
DERB	soil landuses	615
DERB	soil sites	552
GLEN	drainage sites	7334
HEBS	drainage sites	3771
HULL	soil contaminants	1623
HULL	soil clasts	2189
HULL	soil drifts	817
HULL	soil geologys	817
HULL	soil horizons	1222
HULL	soil landuses	501
HULL	soil landuses	1623
HULL	soil sites	817
HUMB	drainage sites	4308
HUMB	soil sites	13745
LAKE	drainage minerals	1
LAKE	drainage sites	6406
LINC	soil contaminants	441
LINC	soil clasts	779
LINC	soil drifts	431
LINC	soil geologys	434
LINC	soil horizons	644
LINC	soil landuses	228
LINC	soil landuses	441
LINC	soil sites	431
LIVB	drainage sites	5367
LIVB	soil sites	2068
MANS	soil contaminants	587
MANS	soil clasts	875
MANS	soil drifts	515
MANS	soil geologys	519
MANS	soil horizons	776

ATLAS	INFO TYPE	COUNT_ROWS
MANS	soil landuses	287
MANS	soil landuses	587
MANS	soil sites	517
MOBU	drainage minerals	22
MOBU	drainage sites	4600
NOTT	soil contaminants	840
NOTT	soil clasts	2980
NOTT	soil drifts	1296
NOTT	soil geologys	1297
NOTT	soil horizons	1297
NOTT	soil landuses	653
NOTT	soil landuses	840
NOTT	soil sites	1295
ORKN	drainage sites	775
PETE	soil contaminants	61
PETE	soil clasts	1103
PETE	soil drifts	382
PETE	soil geologys	351
PETE	soil landuses	61
PETE	soil landuses	292
PETE	soil sites	549
SCUN	soil contaminants	251
SCUN	soil clasts	773
SCUN	soil drifts	382
SCUN	soil geologys	380
SCUN	soil horizons	392
SCUN	soil landuses	251
SCUN	soil landuses	494
SCUN	soil sites	392
SHET	drainage sites	2588
STOK	soil contaminants	1343
STOK	soil clasts	2770
STOK	soil drifts	1504
STOK	soil horizons	1508
STOK	soil landuses	1343
STOK	soil landuses	2005
STOK	soil sites	1508
SUTH	drainage sites	2938
SWAN	soil contaminants	1093
SWAN	soil clasts	1971
SWAN	soil drifts	1027
SWAN	soil geologys	978
SWAN	soil horizons	1042
SWAN	soil landuses	1093
SWAN	soil landuses	1449
SWAN	soil sites	1040
TELF	soil contaminants	942
TELF	soil clasts	1412
TELF	soil drifts	593
TELF	soil geologys	593
TELF	soil horizons	593
TELF	soil landuses	812
TELF	soil landuses	942
TELF	soil sites	593
TYFH	drainage sites	5813
TYNE	drainage contaminants	4833
TYNE	drainage drifts	1

ATLAS	INFO TYPE	COUNT_ROWS
TYNE	drainage geologys	221
TYNE	drainage landuses	4833
TYNE	drainage landuses	6662
TYNE	drainage sites	4309
TYNE	soil landuses	2142
TYNE	soil sites	2056
WALE	drainage sites	15929
WALE	soil sites	2408
WOLV	soil contaminants	673
WOLV	soil clasts	185
WOLV	soil drifts	711
WOLV	soil geologys	16
WOLV	soil horizons	695
WOLV	soil landuses	673
WOLV	soil landuses	802
WOLV	soil sites	695
YORK	soil contaminants	521
YORK	soil clasts	61
YORK	soil drifts	384
YORK	soil geologys	384
YORK	soil horizons	384
YORK	soil landuses	440
YORK	soil landuses	521
YORK	soil sites	385

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