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CYPRUS ANVIL MINING CORPORATION

FIELD LOGGING MANUAL

DIAMOND DRILL-HOLE DATA BASE SYSTEM

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FIELD LOGGING MANUAL

DIAMOND DRILL-HOLE DATA BASE SYSTEM

TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS (continued)

1. INTRODUCTION

Geologic information is collected at great expense and considerable risk during exploration and development drilling programs on orebodies. Cyprus Anvil has a computerized drill-hole data management and display system which is designed to store, retrieve and graphically display this information. After drill-hole data has been input to the computer and verified it is readily accessible for a variety of specialized purposes (including weighted averages, lithology search routines, graphics, geostatistics, etc.).

To facilitate computerization, the drill logs are recorded, in the field, on standardized forms. There are seven page types used for all logs. Care must be taken to record all of the information properly, otherwise the geologist will have to spend much additional time on his logs, and lengthy delays will result from having to run computer plots of drill-hole profiles more than once. Small omissions or errors made in the field may seem insignificant until they are multiplied many hundreds of times by a number of people on a large drill program.

This manual forms an integral part of the documentation for the CAMC Diamond Drill-Hole Data Base System. It describes the format for completing the field drill-hole logging sheets. The User's Manual (J. Marlon-Lambert 1983a) provides directions for entering, editing, and processing the field data with the CAMC computer. Technical information concerning the equations, concepts, and definitions used in manipulating the geological data is contained in the Technical Appendices (J. Marlon-Lambert 1983b).

The format described with this manual is consistent with all diamond drill hole logging conducted during and after 1982 field season. Gataga District field logs completed before 1982 have been up-dated and are fully compatible with the current logging format. Logging conventions and practices for the earlier Anvil District drill-holes are described in Hall *et al*. (1981).

2. DRILL-HOLE DATA FORMATS

The drill-hole data consist of a number of observations taken at intervals along the length of the drill-hole. The data recorded on the (pre-printed) field sheets are entered into the computer system using a terminal. Each observation is entered as a separate data record (one per terminal line image). The format of the data record varies for each type of observation, and each data type is identified by a special character code which is written in the first column of the field logging forms. These codes and their associated data types are in Table 1. The codes are listed in the order that they are used when completing the field logging sheets.

TABLE 2.1

CODE	TYPE OF DATA
T	introductory record identifying the drill-hole, including coordinates and elevation of collar
R	down-hole survey orientation data (zenith and azimuth)
C	general comments pertaining to the entire drill-hole
L	lithologic data
S	structural data - orientation of any planar element
$	structural data (same as above)-will be deleted during plotting of the drill-hole profile
F	fault data-orientation, type, thickness of fault gouge, fracture, broken, lost core zones etc.
P	assay sample data - interval, recovery, sample number, rock code for assay information
H	specimen data - interval and sample number for research specimens
E	geotechnical data - rock quality information (this portion of the program is not operational yet).

A and M are Code symbols which have been historically used for assay data associated with the FARO deposit. They will be encountered only rarely in early drill logs.

Note the appropriate code letter must appear in column 1 of the field sheet for each data entry or else the information will not be entered into the data base. This gives the geologist the flexibility of recording supplementary information without it necessarily being displayed on a drill-hole plot. The data and format for each of the above codes are described in detail in the following pages.

3. PAGE CAMC1981-E-1 OF DIAMOND DRILL CORE LOGS

Information to be collected for each drill-hole starts with the summary field sheet which outlines the location, inclination, and other general information for a particular drill-hole. This first sheet is for the information of the geologist and is not entered into the computer DDH data base. The summary field sheet for the diamond drill-hole should be kept up to date as the hole progresses. An example of a completed sheet is shown on page 6 .

3.1 Drill-Hole Identification - Naming the Drill-Hole

The name for a drill-hole is composed of up to seven (7) alphanumeric characters. Intermixed alphabetic letters, numbers and even symbols may be used. The current Cyprus Anvil usage reserves the first character for Department, the second for Project, the next two characters for the year in which the hole was drilled, another character to denote the deposit and two more characters for the number (in the year) of the hole. An example from the Cirque deposit drilling program in 1979 is: "EG79C14" (Exploration-Gataga-1979-Cirque-Hole No. 14). Any 1981 Feasibility and Development holes could be labelled "FG81C02". This drill-hole identification is used for all data collected from this hole and is recorded on every page of the drill log. Codes for all 1981 projects are listed in Appendix III.

CYPRUS ANVIL MINING CORPORATION

Page 1 of 24

DIAMOND DRILL CORE LOG

Date: July/81

Hole Number: EG 81C11

Project: GATAGA

Location: Cirque Backside

Claim: CIRQUE #4

Terr.Plane Co-ords.: 6,374,645.6 N

371,931.0 E

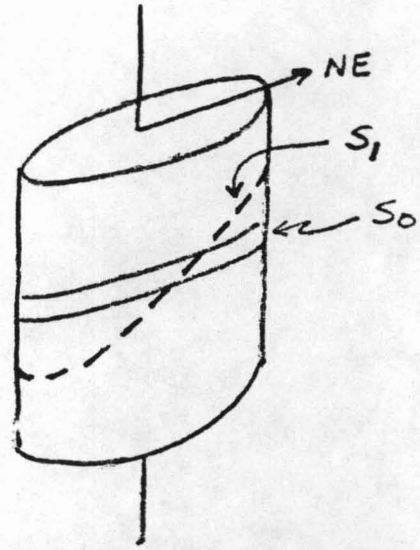
Grid Co-ords.: SECTION 283+50N

Inclination: -80° towards 050°

Elevation: 1719.57m.

Total Depth: 770.2 m

Reference Fabric Orientation Diagram:



All symmetry determinations looking

NW with S1 dipping

SW with dip azimuth 220°.

Purpose: Test adit site and potential of Earn Gp. on backside

Reason hole Terminated: Intersected footwall Silurian Siltstone

Logged by: VZS, CWJ, LCP, WJR

Date(s) Logged: July 17-30/81

Drilling Contractor: J.T. Thomas 44 #4

Size	CORE From	To
CASING	0.0	12.2
NQ	12.2	770.2

Collar Cased and Capped: No

Hole Cemented: No

Steel down hole: No

Started: July 13/81 Completed: July 30/81

4. PAGE CAMC1981-E-2 OF LOGS: LOCATION, SURVEYS, COMMENTS

Field sheet CAMC1981-E-2 is the first computer-coded page of the drill logs. This sheet contains general information with T, R, and C subfiles. A completed example is illustrated on page 11 of this manual. This sheet includes the name and geographic location of the drill-hole (T-subfile). In addition it lists the necessary down-hole survey points (R-subfile) which allow for calculation of the three-dimensional position of any down-hole observation. Space at the bottom of the sheet is provided for general comments concerning the drill-hole (C-subfile).

4.1 Type "T" Data (Drill-Hole Name and Location Data)

This data record is the drill-hole header and must always be the first computer record of the set of data for a drill-hole. The record contains the drill-hole identifier, collar elevation, collar coordinates and the system of measurement (feet or metres). The data format is as follows:

col 1	--	card code -- "T"
col 2-8	--	drill-hole identifier of 1-7 alphanumeric characters (see page 5). All other data for this drill-hole must have this identifier or they will be rejected.
col 10-16	--	collar elevation
col 17-24	--	collar northing coordinate (generally UTM coordinates)
col 25-32	--	collar easting coordinate (generally UTM coordinates)
col 34-39	--	units of measurement for the depths and coordinates. FEET or METRES, <u>if left blank metres are assumed</u>
col 41-42	--	R.F.E. - reference fabric element - for symmetry determination, e.g. S1, S2. (this will be explained in Section 6).

NOTE: Col 10-16, 17-24, 25-32 and 41-42 must be entered. If not available, dummy values should be input. e.g. zeros.

When the data are entered all alphanumeric field are left justified in their fields while the numeric fields (elevation and coordinates) are right justified with the decimal implied at the end of the field if it is not entered with the data.

4.2 Type "R" Data (Down-Hole Survey Data)

This record is used to enter survey data measured at intervals down the drill-hole. The survey data (Figure 4.2.1) consist of the borehole azimuth, relative to true North; and the borehole inclination entered as a zenith angle defined as follows:

0 vertically upwards

90 horizontal

180 vertically downwards

All angles are measured in decimal degrees.

NOTE: At least one survey record must be present in the set of data for a borehole giving the azimuth and inclination at the collar. (Unless the hole is inclined, these are normally 0 and 180 degrees, respectively). No values for the collar azimuth is needed if the zenith angle is 0^0 or 180^0.

Entries of "R" data are made in the following format (see example on page 11):

col 1 -- card code -- "R"

col 2-8 -- drill-hole identifier; this must be the same as on the type "T" header record

col 10-14 -- depth at which the measurement was - entered as an integer in units of 0.1 metres (feet) i.e. 02500 = 250.0.

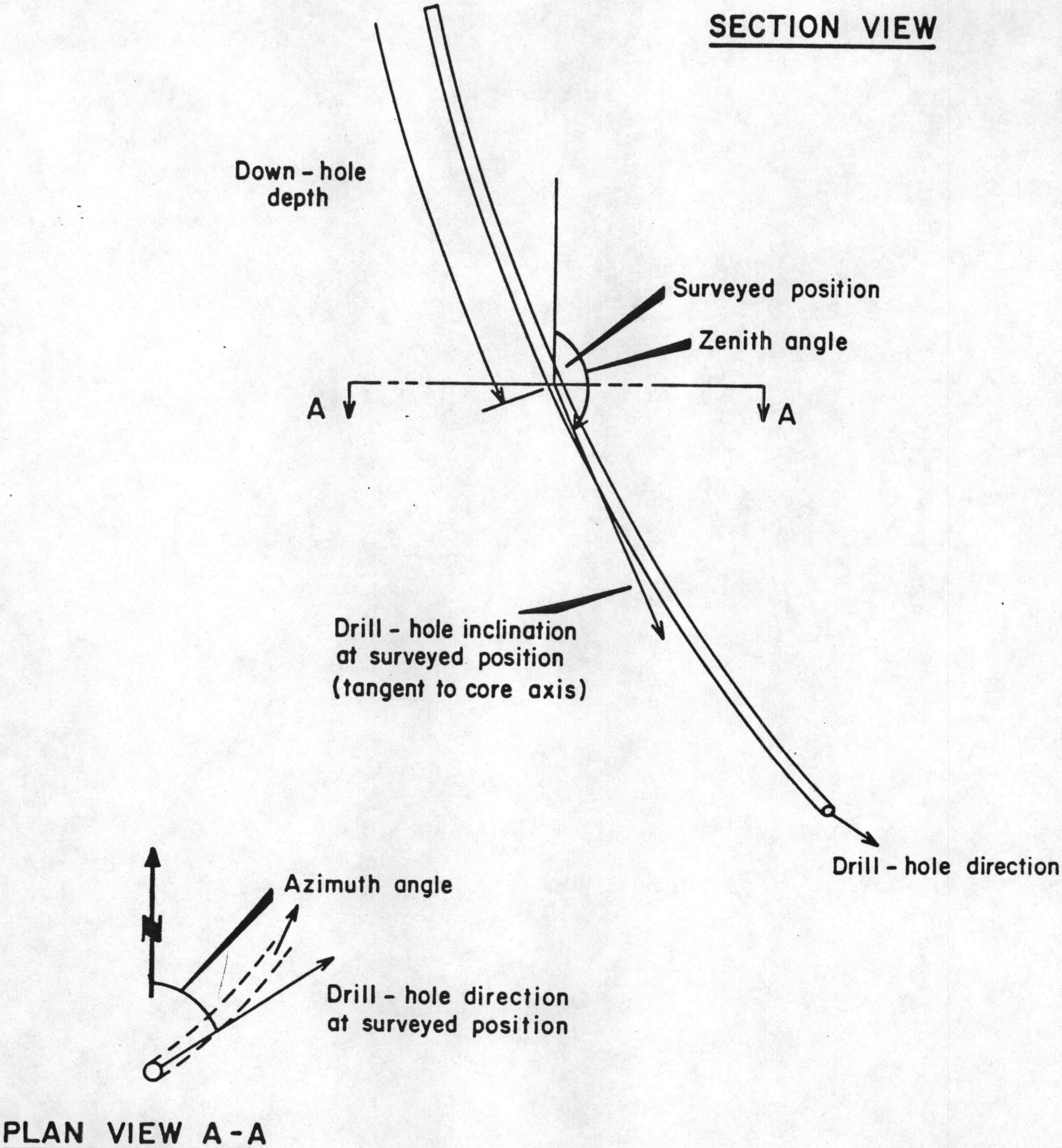


Figure 4.2.1 DEFINITION OF DOWN - HOLE SURVEY ANGLES

col 22-26 -- the drill-hole inclination measured at the depth and entered as a zenith angle as defined above. The angle is in terms of decimal degrees and must be entered to the nearest 0.1 degree. (see Figure 4.2.1)

col 28-32 -- the drill-hole azimuth measured at the depth. This angle is measured clockwise from true north. The angle is measured in decimal degrees and is entered the same as the inclination.

col 35-36 -- optional comment field - available for any comment concerning the reliability of a particular measurement.

Note that the survey point at a depth of 91.4 metres on page 11 has been listed as 'suspect'. Because the field geologist has decided that this reading is bogus, he has drawn a line through this measurement. Consequently the reading will not be entered into the data base. Alternatively, he could have interpolated values for the zenith and azimuth angles and noted in the R-comments field that they were "guestimates". This alternate approach is illustrated in the lower part of the R- subfile field.

4.3 Type "C" Data (Comments)

This record is used to store comments about the drill-hole. C-subfile data may be used only on this field sheet in columns indicated. The format of the record is as follows:

col 1 -- card code -- "C"

col 2-8 -- drill-hole identifier - this must be the same as the type "T" header record.

col 10-51 -- comment text field. This may contain any explanatory notes the geologist cares to add to the quantitative data pertaining to the drill-hole.

Cyprus Anvil Mining Corp.

Diamond Drill Core Log

DDH EG81C01 (2–8)

Date: May 15/81 Logged By: DBK, WJR, LCP, CWJ

Code (1)	Drillhole (2–8)	Elevation (10–16)	Northing (17–24)	Easting (25–32)	Units (feet/metres) (34–39)	R.F.E. (41–42)	
T	EG81C01	1832.9	375332.2	370366.5	METRES	51	

Code (1)	Drillhole (2–8)	Depth (10–14)	Zenith Angle (22–26)	True Azimuth (28–32)	Comments (34–56)
R	EG81C01	00	180.0	0.0	AT COLLAR
R	EG81C01	305	176.5	010.0	
~~R~~	~~EG81C01~~	~~914~~	~~152.0~~	~~180.0~~	DO NOT TRUST THIS
R	EG81C01	1524	170.0	012.0	
R	EG81C01	2134	156.0	022.0	
R	EG81C01	2743	150.0	018.0	
R	EG81C01	3353	148.0	023.0	
R	EG81C01	914	173.0	011.0	ZEN. + AZ. INTERPOLATED

Code (1)	Drillhole (2–8)	Comments, Errant Remarks, Snivellings and / or Lewd Suggestions (10–56)
C	EG81C01	SPERRY-SUN SUSPICIOUS AT 91.4
C	EG81C01	POSSIBLY HUNG UP IN DRILL RODS

5. PAGE CAMC1981-E-3 OF LOGS: LITHOLOGY

5.1 Type "L" Data (Lithology Data)

The lithology page is used to enter the sequence of lithologic units observed over the length of the drill-hole. Two different forms of sheet CAMC1981-E-3 are shown on pages 16 and 17. Either format is compatible with the computer data base. It is imperative, however, that the field geologist write an adequate description of the lithologic units as they are logged. Experience has shown that the lithologic codes developed for a district are subject to significant change, and new coding of a unit is difficult without a detailed description of the core.

Completed examples of the field sheet are illustrated on pages 16 and 17. The format of the record is as follows:

col 1 -- card code -- "L" (must accompany any data to be entered into the data base)

col 2-8 -- drill-hole identifier; this must be the same as on the type "T" header record

col 10-14 -- beginning 'From' depth of the lithologic unit. The depth is entered in units of 0.1 metres (feet) as an integer number; i.e. 1500 is 150.0. Where 'From' is not entered it is assumed to be the same as the 'To' of the preceeding "L" entry.

col 16-20 -- ending 'To' depth of the lithologic unit. This depth is entered in the same manner as the beginning depth

col 22-24 -- recovery in metres (feet) giving length of core actually in core box. If left blank, value is set at -0.5 to indicate not measured.

col 26-28 -- number of lithologic entry, for organization and retrieval use. This has always been an integer sequence number, in increasing order from the unit directly beneath the collar, beginning with 001.

col 30-34 -- lithologic unit. These units are assigned by the project geologist to cover all rock types expected to be encountered.

col 35-65 -- The first line of the Description field (sheet E3) is reserved for up to 30 characters of additional lithologic description using the alphanumeric code. These columns allow for description of primary features, secondary alteration features, and listing of lithologies which occur in subordinate amounts. Examples of the use of this space are presented on pages 16 and 17. For the Anvil example (page 16) subordinate lithologies are indicated by parentheses. Relative amounts of these lithologies are indicated by the numbers (percents) listed on the same line.

col 66 -- verbal description of unit, not entered in the data base. This space is reserved for the detailed descriptions of the rock types (for later use in trying to remember the "look of the rock"). It starts on the second line of the Description space and continues for as long as necessary. Note in the examples that these lines do not have an "L" in column 1.

5.2 Lithologic Units for the Gataga Area

The primary lithologic unit is designated by a five character code:

char 1,2 -- alphabetic (A-Z), denoting AGE (e.g. D = Devonian), GROUP or FORMATION (e.g. G = Gunsteel)

char 3,4 -- alphabetic (A-Z) denoting FORMATION (e.g. W = Warneford), rock type or member (e.g. PH = phyllite, hanging wall)

char 5 -- alphabetic (A-Z) or blank denoting modifier (e.g. B = barite nodules)

- any additional modifiers in the first line of the Description space are also coded and included within the data base.

Details of lithologic units including OVERBURDEN and FAULTS are given in the lithostratigraphic column used for the Gataga District (Appendix I).

5.3 Lithologic Units for the Anvil Area

The primary lithologic unit is designated by a five character code:

char 1,2 -- alphanumeric denoting AGE or FORMATION, right justified

char 3 -- alphabetic (A-Z) denoting member

char 4,5 -- alphanumeric (A-Z) denoting modifiers, left justified and in decreasing order of importance.

e.g. 4 A 4 5

- any additional modifiers in the first line of the Description space are also coded in the data base.

Details of lithologic units are given in the lithostratigraphic column used for the Anvil District (Appendix II).

In both districts fault zones are logged as separate lithologic units (see examples). Formatting of the lithology code for faults depends on the district. Any details concerning orientation of fault zones, type of faulting, and condition of the core should be noted in the Description space. A separate Fault logging sheet will be discussed in Section 7 of this manual.

5.4 Lithologic Units for New Projects

Manager(s) of new projects will be responsible for designating lithologic units for their areas, using a 1 to 5 character code. Structural observations can be included with the lithologic descriptions. It is still compatible with the computer system but need not be computerized in the early stages of projects that may not be successful.

DDH F.A.G.A.0.3.9 (2–8)

Cyprus Anvil Mining Corp.

Lithologic Log

Page 3 of 15

Date: ________ Logged By: DSJ / GAS

Code	From (10–14)	To (16–20)	Recov. (22–24)	No. (26–28)	Unit (30–34)	Description (35)
L	00	61		1	*	OVERBURDEN – CASING TO 16'
L	61	181		2	5B28	0 (0Q0) 95:5
						Slight green tinge in cut surface but
						good grey phyllitic partings – core
						extensively broken but no significant
						gouges
L		197		3	5D0	
L		261		4	5B0	± 8 ± 2
L	261	367		5	5A0	(5D0) (0Q0) 85:15: minor
						Only 4 m. of "core" recovered and
						that's mainly small fragments ⇒
						much gouge
L	367	376		6	5A0	(0Q0) 70:30

DDH E.G.8.1.C.1.1 (2 8)

Cyprus Anvil Mining Corp.
Lithologic Log

Date: July 17/81 Logged By: CWJ + VZS

Code	From	To	Recov.	No.	Unit	Description
L	1131	1224		015	DAGHS	+ A
						Dark grey to black, siliceous, graphitic shale w/ fine, discontinuous pyrite laminae and indistinct silty laminae. Numerous rubbly zones 114.9-115.8, 117.9-119.2, 121.2-122.2
L		1274		016	F	+ Q
						Gouge + tectonic breccia w/ qtz-cc veins
L		1291		017	DAGHS	+ A
						As with Unit #15 (113.1-122.4m). 10cm gouge at bottom.
L		1304		018	F	
L		1350		019	DAGHS	
						As in #15 (113.1-122.4) — no concretions
L		1409		020	DAPH	
						Soft grey phyllitic, locally laminated, graphitic shale. Streaky and diffuse pyrite laminae

C.A.M.C. 1981 - E - 3A

6. PAGE CAMC1981-E-4 OF LOGS: STRUCTURE

6.1 Type "S" Data Sheet (Geological Structure Data)

This field sheet is used to record structural observations from the drill core. As these data are often measurements, the observations are assumed to be at discrete points down the drill-hole. The depth of the observation is recorded in the "to-depth" field (col. 16-20). The different data that may be observed and recorded include orientation of any planar element (S_0 bedding, S_1 cleavage, S_2 cleavage....) with respect to the core axis, symmetry information (vergence), type(s) of cleavage present, and stratigraphic facings--stratigraphic tops up or down the DDH.

Examples of the structural logging sheet are illustrated on pages 20 and 21. Page 20 is a typical example for the Gataga area; page 21 is an Anvil example. The format of the logging form is as follows:

col 1 -- card code -- "S" or "$"
"S" is used for data which is to be plotted on the drill-hole projections.
"$" is used to enter observations in the DDH-data base which are not to be plotted on the drill hole projections.

col 2-8 -- drill-hole name (identifier).
This must be the same as that used with the type "T" information).

col 10-14 -- from depth of the observation.
This depth is recorded to the nearest 0.1 metre (foot) with the decimal point assumed between columns 13 and 14. It is used only for zone observations. With point observations it must be left blank.)

col 16-20 -- to-depth of the observation.
This depth must be present and is taken as the depth at which the observation was made. The depth is recorded in units of 0.1 metres (feet) with the decimal point assumed between columns 19 and 20.

col 22-24 -- feature field.
This field is used to insert descriptive information about the reference fabric element during the structural logging. It is not plotted. Permitted codes are PSn, CSn, and DDn; these are explained in Section 6.2.

col 26 -- symmetry code
The permitted symmetry codes are S, M, Z, E, and 3. These codes describe vergence relations for the reference fabric element and are defined in Section 6.3. The codes are plotted on the structural projection of the drill-hole. Symmetry may be either a zone or point observation. With point observations of symmetry the From-depth field is left blank. For zone observations both the From-and To- depth fields are completed in the log. If this field is blank it was not measured or observed.

col 28-32 -- observation for the S_0 plane as follows:
col 28-29 angle to the core axis (0-90)
col 30-32 dip-direction (0-360) with respect to the reference fabric element measured clockwise (see Fig. 6.4.2).

col 34-38 -- observation for the S_1 plane as follows:
col 34-35 angle to the core axis (0-90)
col 36-38 dip-direction (0-360). Where S_1 is the reference fabric element the azimuth is inserted once at the top of the field sheet or where the azimuth changes. Where another planar feature is the reference fabric element, the dip-direction of S_1 is measured clockwise with respect to the reference fabric element.

col 40-44 -- observation for the S_2 plane as follows:
col 40-41 angle to the core axis (0-90)
col 42-44 dip-direction (0-360). Where S_2 is the reference fabric element the azimuth is inserted once at the top of the field sheet or where the azimuth changes.

col 45 -- description
This field is not entered into the computer drill-hole data base. It is available for any comments on measurements recorded in columns 28-44. It is also used to sketch minor folds noted in core. A useful feature recorded here for future reference is stratigraphic facings directions.

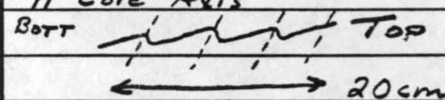
More detailed discussions of the features recorded on this sheet are presented in the following pages.

CIRQUE EXAMPLE

DDH E.G.8.2.C.1.0 (2 … 8) **Cyprus Anvil Mining Corp.** Page 18 of 24

Structural Log Date: 8/20/82 Logged By: DBK, CWJ, LCP, WJR

Code 1	From 10–14	To 16–20	Feature 22–24	Sym 26	S_0 Dip (28)	S_0 Direct. (–32)	S_1 Dip (34)	S_1 Direct. (–38)	S_2 Dip (40)	S_2 Direct (–44)	Description
S		1660			65	000	42	220			
S		1705			70	000	53				Bioturbation - Tops up
S		1770			72	000	54				
S		1805			74	020	50		22	000	
S		1830			75	030	48				
S		1925			75	030	44				
		1966									Shearing // S_1 - 55°
S		2030			68	000	48				
		2035									Bioturbation - Tops up
S		2100			05	000	55				Major S-limb, sheet dip // Core Axis
S		2150			72	030	60				So pyrite laminae, S_1 core break



EOH

ANVIL EXAMPLE

DDH FAGU210 (2 … 8)

Cyprus Anvil Mining Corp.

Structural Log

Page ________ of ________

Date: ____________ Logged By: ______________

Code	From	To	Feature	Sym	S_0/S_2 Dip	S_0/S_2 Direct.	S_1 Dip	S_1 Direct.	S_2/S_4 Dip	S_2/S_4 Direct.	Description
1	10–14	16–20	22–24	26	28	32	34	38	40	44	
											RFE S2
S		345	PS2						70	210	↓
S		500	PS2						70		↓
S		870	PS2						65		↓
											RFE S4/S_2 = S_4, S_0 = S_2
S		1250	CS4	Z	80	000			60	210	S_0 = S_2
S		1385	CS4	Z	00	010			30		S_0 = S_2
											RFE S2/S_2 = S_2
S		1700	CS2						70	210	↓
S		2000	PS2						80	210	↓
S		2230	PS2						75		↓
S		2570	PS2						35		↓
											EOH

6.2 Feature Codes (columns 22-24)

Permitted feature codes are PSn, CSn, and DDn. These are descriptive codes for the reference fabric element noted in the drill-core.

PSn where n = 1, 2, 3, ...

PS is a specific term referring to a pervasive fabric element such as pressure-solution striping, slaty cleavage, or schistosity. The n refers to the particular phase of deformation associated with the planar fabric element. Three criteria should be used to recognize this fabric:

a) it is present in more than one rock type
b) microlithon structures are not visible
c) ideally there should be a transition from a crenulation cleavage to a closely spaced crenulation cleavage to a pervasive schistosity /cleavage.

PS2, therefore, refers to a pervasive S_2 schistosity or cleavage developed in the core.

CSn where n = 1, 2, 3, ...

CS refers to a well-developed crenulation schistosity/cleavage. As above, n delineates the deformation phase associated with the crenulation schistosity. CS1 will only be rarely observed because generally the S_1 cleavage is pervasively developed. Again, this code refers only to the reference fabric element.

DDn where n = 1, 2, 3, ...

The term DD is used when the axis of a minor fold (microlithon) is parallel to the major axis of the reference fabric element in drill core. Again n refers to the deformation phase associated with the fold axis and the reference fabric element. With this special case, symmetry of the drill core is not readily determined visually. It must be identified with respect to fold plunge (i.e. S looking down plunge or Z looking up plunge.)

6.3 Symmetry Codes (column 26)

Symmetry codes refer to the angular relationship between the surface being folded and the reference fabric element axial planar cleavage of a fold. In both Anvil and Gataga areas folds are usually overturned. Figure 6.3.1 illustrates the symmetry relations between the folded surface and the axial plane cleavage (R.F.E.). The upright folded surface has Z-symmetry (note minor folds) and the S-limb has an overturned facing direction.

Permitted symmetry codes in column 26 are S, Z, M, E, and 3. Symmetry codes refer to angular relation between the reference fabric element (= axial plane cleavage) and the surface being folded. In Gataga these surfaces are S_1 and S_0 respectively. In Anvil the equivalent surfaces are usually S_2 and S_1.

The codes often may be used as both point and zone observations. Point observations apply to a specific observation noted in core; in this case

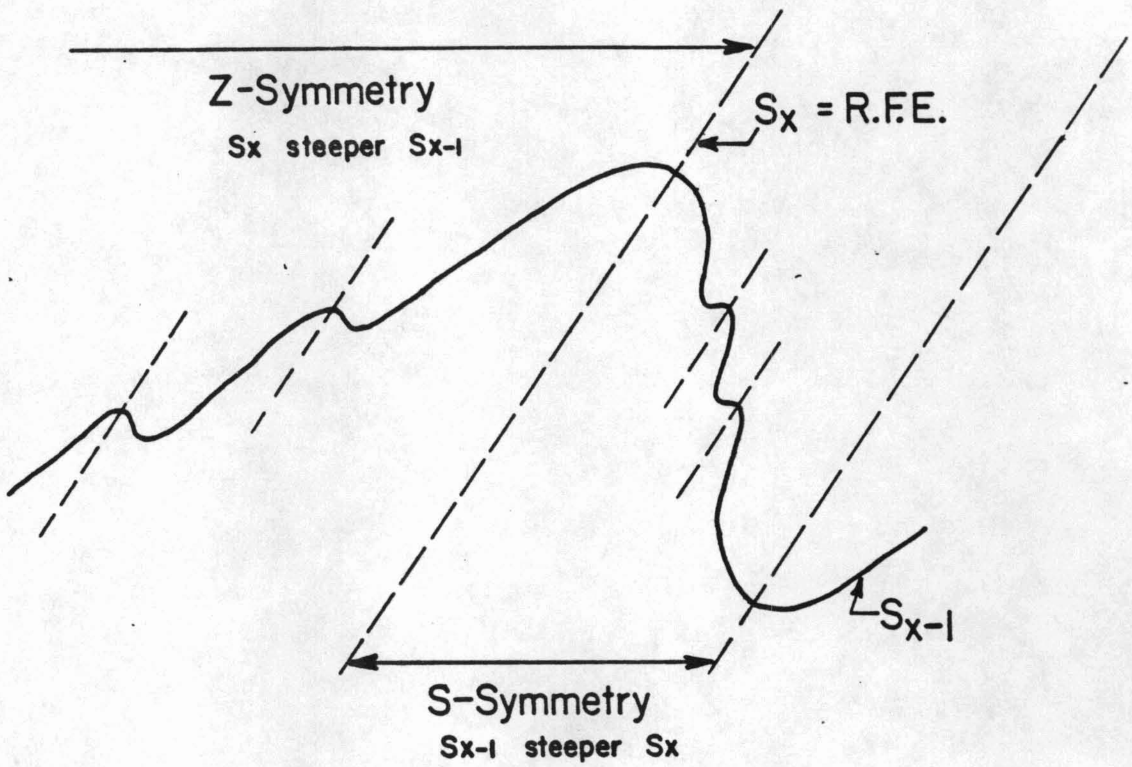


Figure 6.3.1 Fold Symmetry

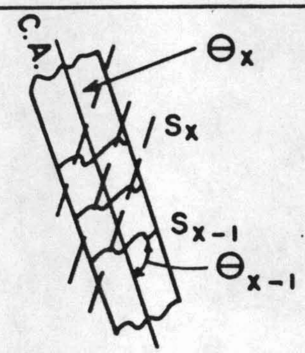
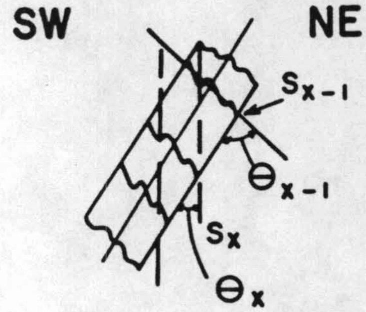
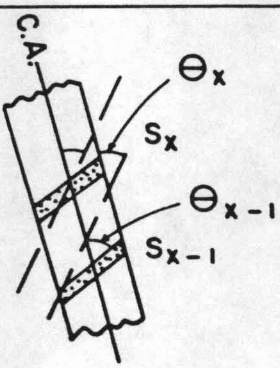
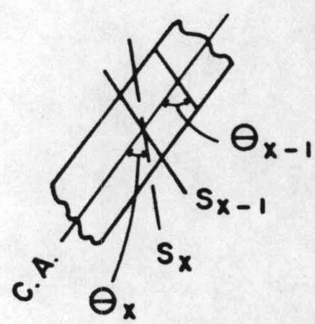
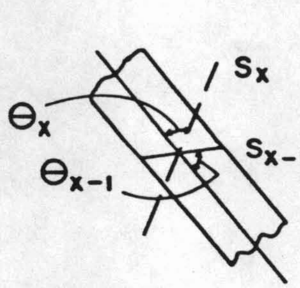
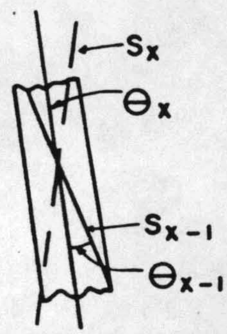
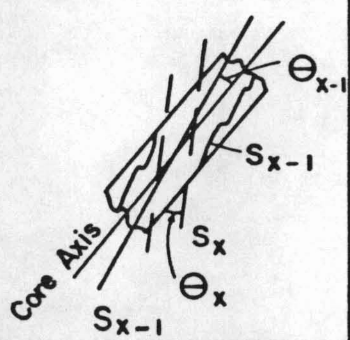
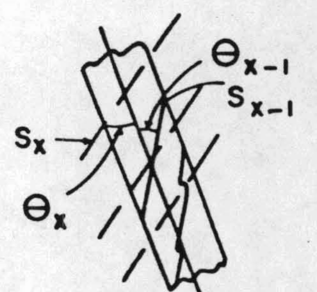
only the To-depth field is completed in the field log (columns 16-20). In many cases, however, the symmetry code is valid for an entire interval of core; the zone with symmetry noted is indicated by completing both the from- and to-depths (columns 10-14 and 16-20). Figures 6.3.2 and 6.3.3 illustrate several examples of symmetry in core.

1) S and Z refer to observed S- or Z- symmetry in microlithons and minor folds (Figure 6.3.1).Both point and zone observations are allowed. For concordance in logging, symmetry should be determined with the core axis oriented in the appropriate drilling position. This obviously means that some symmetry observations will be incorrect because of uncertainties in core orientation. Symmetry interpretation must therefore be constantly interpreted with caution.

2) M refers to a zone of mixed symmetry usually implying a hinge zone of uncertain vergence. Typical examples include large hinge zones or short, steep limbs. Use of this symbol allows for uncertainty in locating symmetry changes over large zones. Both zone and point observations are allowed.

3) E and 3 are used for actually observed fold closures in the drill-core. As such they are point observations. These symbols also have implied symmetry changes associated with them. For E the zone above the symbol has implied S-symmetry and the zone below has Z-symmetry. For 3 the overlying zone has implied Z-symmetry and the underlying zone has S-symmetry.

Figure 6.3.2 Core Symmetry

Fabric Elements	"Z" Symmetry	"S" Symmetry
$\Theta_{X-1} > \Theta_X$ with minor folds Same dip azimuth dir.		
$\Theta_{X-1} > \Theta_X$ Same dip azimuth dir.		
$\Theta_{X-1} = \Theta_X$ Opposite dip azimuth directions		
$\Theta_{X-1} < \Theta_X$ Same dip azimuth dir.		

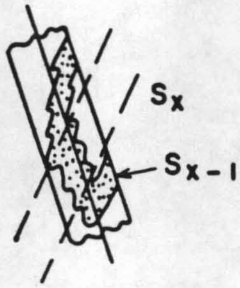
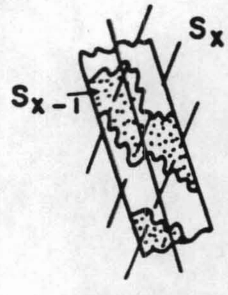
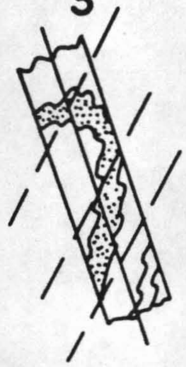
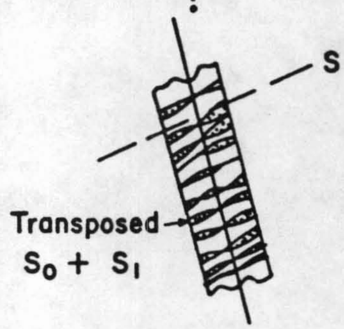
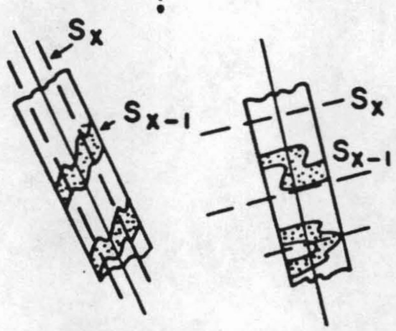
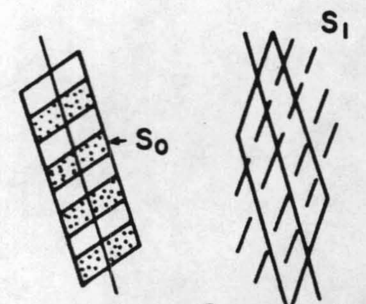
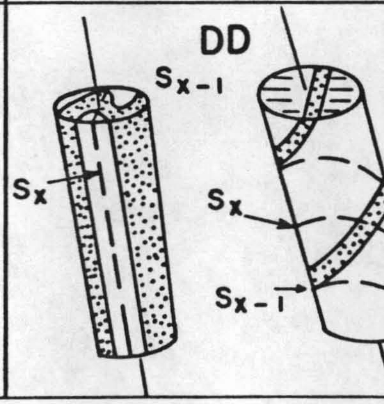
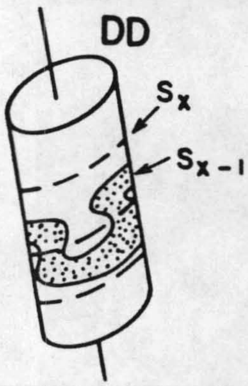
Fabric Elements	Symmetry Examples	Symmetry Examples
S_x; minor folds in S_{x-1}	SW "E" NE 	SW M NE 
S_x; minor folds in S_{x-1}	"3" 	? 
S_x, S_{x-1}	? 	?  S_1 not visible S_0 not visible
Dip azimuth direction $S_x \perp$ dip azimuth direction S_{x-1}	DD 	DD 

Figure 6.3.3 Core Symmetry

6.4 Sn Codes Where n = 0, 1, 2, ...

Sn is a point observation of the orientation of a particular planar element with respect to the core axis. n describes the deformation phase associated with the S-surface being measured. S_0 refers to primary sedimentary bedding, S_1 refers to the axial plane cleavage formed during the first phase of deformation, etc.

Sn surfaces can be divided into two major categories:

1) reference fabric element (R.F.E.) = Sx
2) other planar surfaces = Sx-i where i = 1, 2, ..., x

In the following discussion these two types of surfaces will be discussed separately. Measurement of each surface is similar. In all calculations of orientations of the planar elements measured for a DDH, the R.F.E. (Sx) is assumed to dip in a direction specified by the field geologist.

6.4.1 Sx = Reference Fabric Element

The R.F.E. is defined as the planar element which is developed throughout the core for a particular DDH and has a constant dip line azimuth (dip direction) in the area of the DDH. Because it is assumed to have a constant dip direction, the R.F.E. (Sx plane) should ideally be the axial plane cleavage for the latest deformation phase observed in drill core. In the Gataga area Sx is normally S_1; in the Anvil area it is commonly S_2.

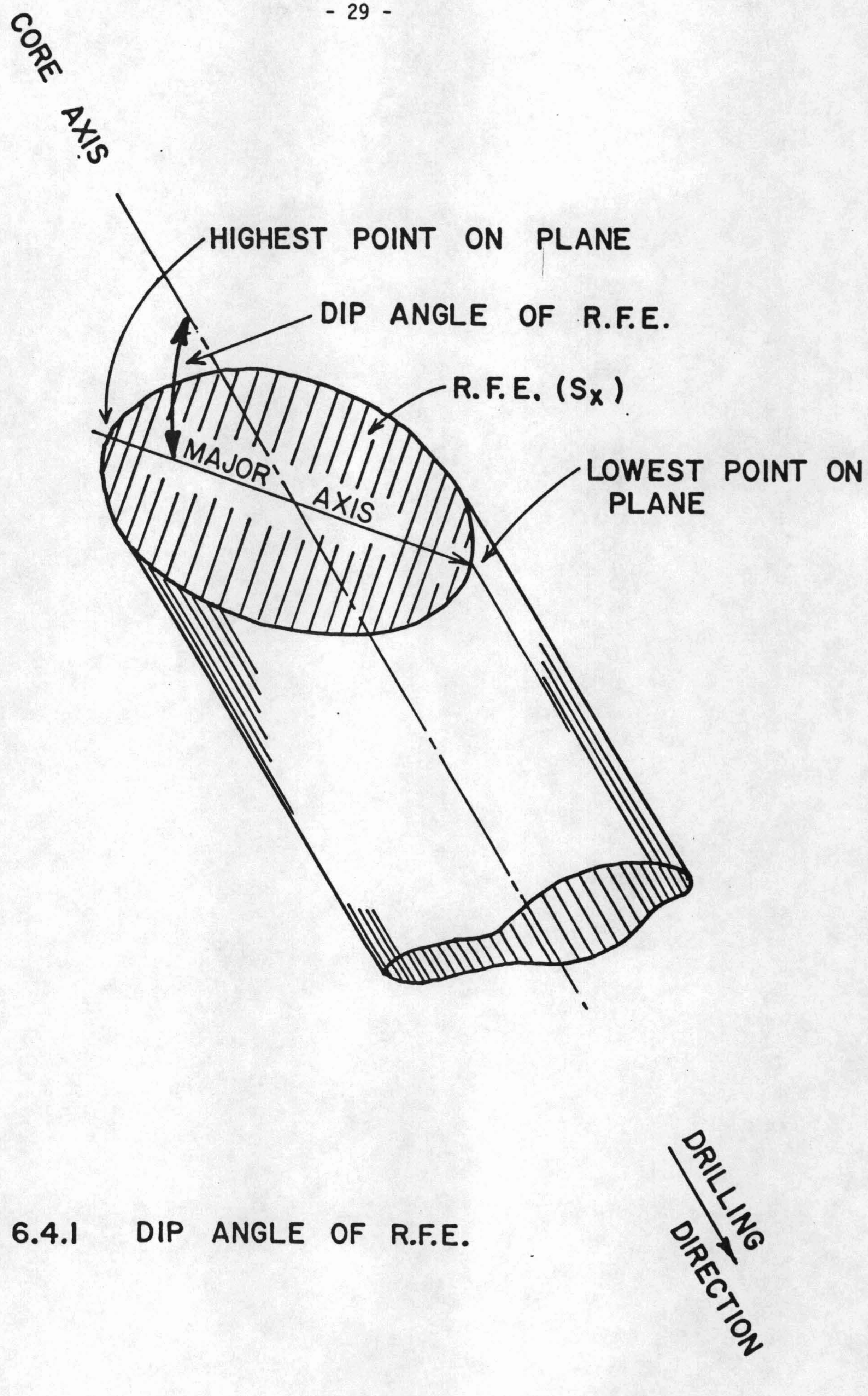


FIGURE 6.4.1 DIP ANGLE OF R.F.E.

The deformation cleavage (reference fabric element) for a particular DDH is specified in the "T" line of field sheet CAMC 1981-E-2 (columns 41-42). An example is illustrated on page 11.

Measurement of the R.F.E. plane in drill core is illustrated in Figure 6.4.1. The intersection of the R.F.E. plane with the core cylinder is commonly marked on the edge of the core using a grease pencil or felt marker. Because the R.F.E. in both Anvil and Gataga areas is a schistosity/cleavage, this line is often defined by the way the core breaks. The R.F.E. (S_x) core intersection is a plane with an elliptical outline. The field geologist measures the angle between the lowermost point on this plane (major axis of the ellipse) and the core axis. This angle is readily measured using a contact goniometer or a protractor. It is recorded on the logging sheet (CAMC 1981-E-4) in the Dip columns of the appropriate deformation fabric (commonly S_1 or S_2).

The R.F.E. is assumed to have a constant dip direction (dip line azimuth) for the entire drill hole. It is determined by averaging measured dip directions of surface outcrops in the vicinity of the drill hole. The averaged dip line azimuth is recorded in the Direction columns of the appropriate deformation fabric (commonly S_1 or S_2). Since this direction is constant, it is commonly entered into the structural logs only on the first line of each page.

6.4.2 Other Related Planes: Sx-i; i = 1, 2, ... x

The orientation of any other plane within the drill core is measured with respect to the core axis and the reference fabric element (Sx plane). Its orientation in true space can then be calculated since the orientations of the drill core and the R.F.E. are known and/or assumed.

Two measurements are made and recorded for Sx-i. These are illustrated in Fig. 6.4.2. To make the necessary measurement the core is conventionally held vertically with the direction of drilling being down. The lowest points on the planes representing Sx and Sx-i are identified and marked on the side of the core. The 'dip' field for Sx-i is measured with respect to the core axis in the same manner as done for the R.F.E. For the 'Direct' field the angular distance between the lowest point on the R.F.E and the lowest point on the Sx-i plane is measured in a clockwise direction around the circumference of the drill core cylinder. This angle ranges from 0^o to 360^o. (If they dip in the opposite directions the measured angle is 180^o.)

Locally in a drill-hole a later cleavage may become the dominant, pervasive planar fabric present. In Anvil, for example, S4 may be locally dominant with S_2 being the folded planar element. In this situation the R.F.E. in the S4-dominant area must be changed to S_4. An example of a series of structural measurements with the indicated change in R.F.E. is illustrated on page 21. Note that the description field (column 45-) is used to clearly outline the change in R.F.E. as well as denote that the three Sn fields (column 28-44) are being used for different deformation phases than those recorded in the rest of the drill-hole.

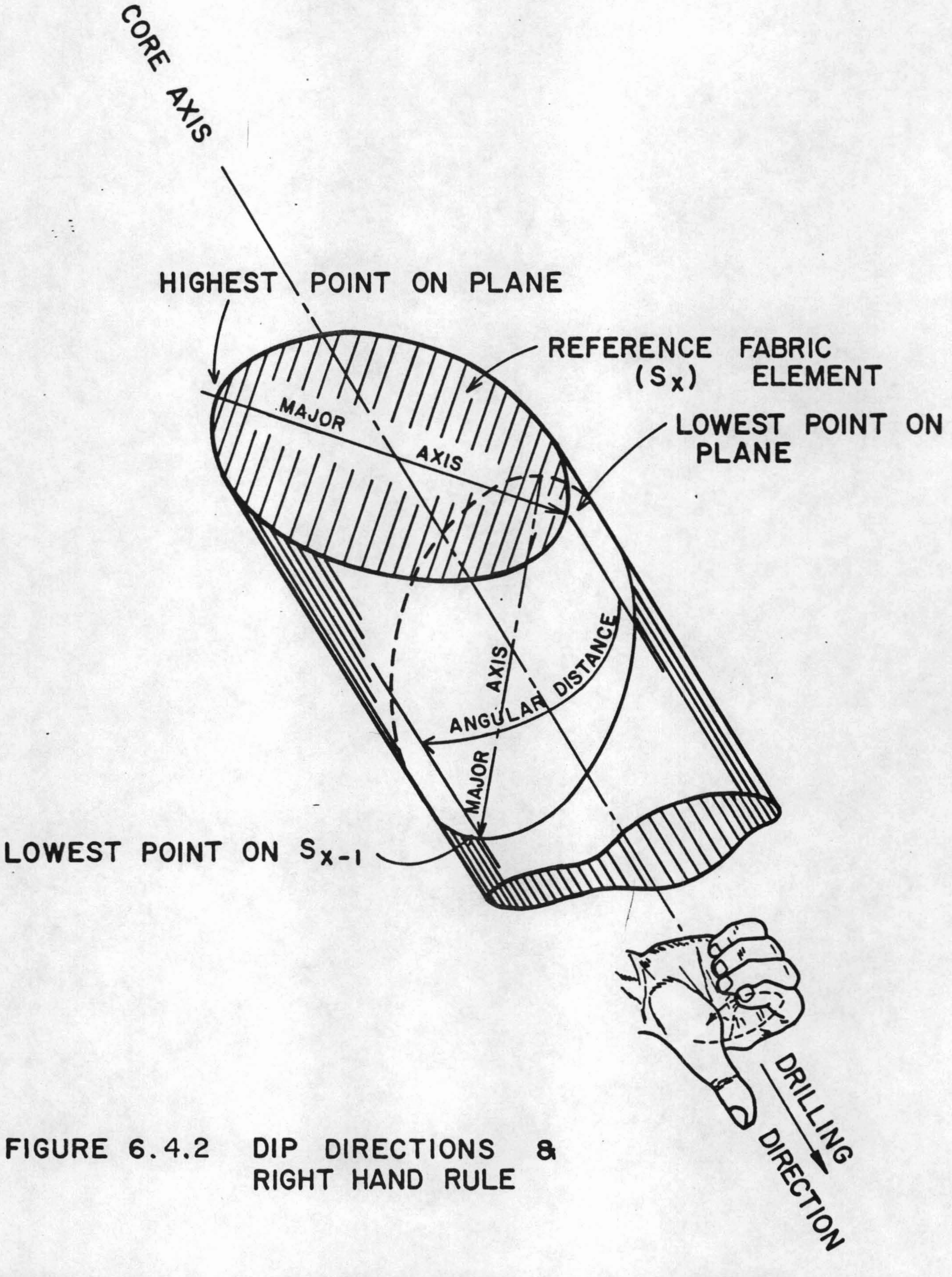


FIGURE 6.4.2 DIP DIRECTIONS & RIGHT HAND RULE

6.4.3 Other Related Planes Sx+i, i = 1, ... n

Ideally, the R.F.E. should be the planar surface formed during the latest deformation event. All other measured planar elements in the drill-hole would be related to original sedimentary deposition or earlier deformation events. Pragmatically however, late deformation fabrics are often encountered as weakly or inconsistently developed planes in a particular drill hole. Since they are not pervasively developed, they do not form a suitable R.F.E.. In these particular cases it is practical to keep the R.F.E. as the latest pervasively developed planar feature and to measure these later planes with respect to this R.F.E. surface. These later planes are then plotted in projection as Sx+1 surfaces in a separate drill-hole structural plot.

An example of this situation is present in some Gataga drillholes. The typical R.F.E. is S_1. Locally S_1 is disrupted by a weakly to strongly developed S_2 crenulation cleavage. In most cases the S_2 cleavage does not significantly fold the earlier S_1 cleavage. In this situation it is practical to measure S_2 with respect to S_1. A separate structural plot for these drillholes contains only S_2 (Sx+1) and S_1 (Sx-RFE) planes in the plane of the projection.

6.5 Structural Logging - scale considerations and problems with field logging

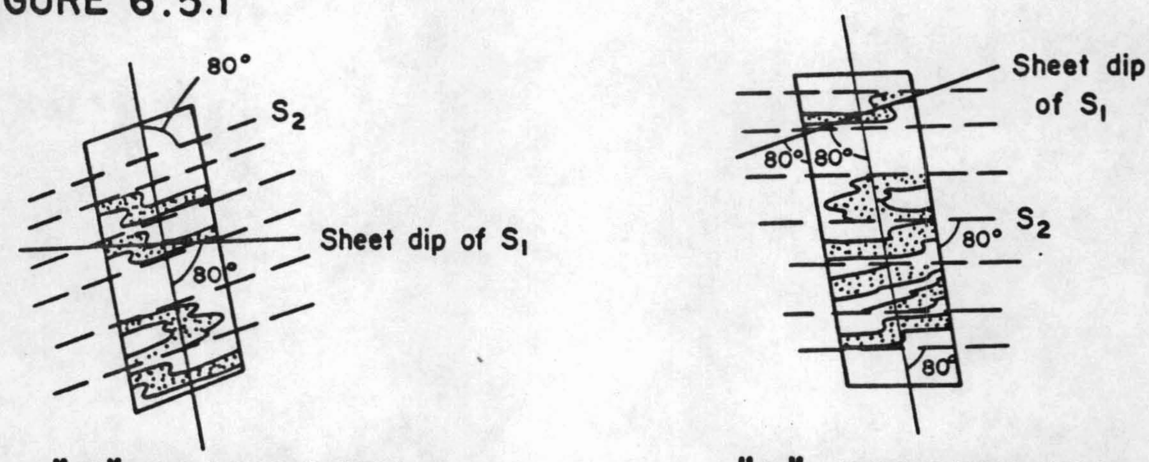
Structural information from the field logs is typically displayed on a down-hole projection of the drillhole. Obviously the density of structural readings while logging core is related to the scale used when projecting the drillhole data. If structural observations are done at intervals too close for the scale of the plot, the plotted structures overlap and are difficult to properly interpret.

Previous experience has dictated a practical density for structural observations while logging drill core. For readily legible structural plots the following distance between structural readings is suggested:

PLOTTING SCALE	STRUCTURE MEASUREMENT EVERY
1:1000 (1"=83.3')	3-6 metres
1:6000 (1"=500')	18-36 metres
1:1200 (1"=100')	6 metres (20 feet)

Symmetry determinations are often difficult to impossible to determine from drill core when the RFE is at an angle of 70-90^{o} to the core axis. This situation is aptly illustrated in Fig.6.5.1. The RFE (S_2) is almost normal to the drill core axis. Two solutions for S_1 and S_2 are often possible with S_2 dipping in the same direction for each solution. These solutions typically

FIGURE 6.5.1



"Z" POSSIBILITY "S" POSSIBILITY

have an opposing sense of vergence. In this situation independent stratigraphic facing indicators are needed to arrive at a unique symmetry solution.

In the Anvil area the S_2 (RFE) cleavage is typically at a high angle to the core axis for surface exploration drillholes. Therefore appropriate symmetry determinations are often difficult to impossible to delineate. This problem is further compounded because the RFE is subhorizontal and is often locally warped to gentle SW and NE dips by later deformation phases. It is often better to ignore symmetry determinations in this situation since they are suspect.

Finally it should be noted that the instructions for measuring the angular distance between the R.F.E. plane and Sx-i or Sx+i planes assumes that the drilling direction was "down" (drill-hole azimuth is between 90^{o} and 180^{o}; see section 4.2). Similar rules are followed for measuring this angle on upward-directed drill-holes. To summarize, the angle between S_x and S_{x-i} or S_{x+i} planes is measured in a clockwise direction around the core circumference when the drill core is oriented so that the observer is looking along the core axis in the direction of drilling.

6.6 Examples of structural logging

Example 1 (Cirque):

Only one main phase of folding has been observed in the vicinity of the Cirque. S_1 (axial planar cleavage) is relatively constant within the immediate vicinity of the deposit; S_1 strikes at about 130^o, dips southwest at about 50^o to 80^o. In all of the structural syntheses for the Cirque drill holes, S_1 is therefore assigned a dip azimuth of 220^o. S_1 is recorded as the R.F.E. in the top right corner of page CAMC1981-E-2, and dip azimuth of S_1 is recorded once at the top of each page CAMC1981-E-4 in columns 36-38 (see example, page 38).

In Figure 6.6.1 on the following page, the core on the left is illustrated as lying in the core box. On the right the core has been picked up and placed in the drilling position as determined by Sperry Sun or gyro tests; the core has been rotated about its axis so that S_1 dips SW. This helps to visualize the structure, although it is not necessary just for measuring S_1 and S_0.

The fabric elements are measured with respect to only the core and each other. Using a protractor or contact goniometer the maximum angle of S_1 to the core axis is measured to be 50^o. The maximum angle of S_0 (bedding) is 80^o. It is also noted that with respect to the core axis, S_0 dips opposite to S_1. Another way to express this is that the lowest point on S_0 is 180^o away from the lowest point on S_1. Thus the direction of S_0 is recorded as 180^{0} on the field sheet and S_1 as 220^{0} even though with reference to the horizontal both have the same dip azimuth, 220^{0}. The direction of the reference fabric element S_1 has already been entered at the top of the field sheet as 220^{0}.

The measurement taken of the fabric elements in this example are recorded on the structural log field sheet as follows:

Code	From	To	Feature	Sym	S_0 Dip Direct.	S_1 Dip Direct.	S_2 Dip Direct	Description
1	10 14	16 20	22 24	26	28 32	34 38	40 44	
S		1360		Z	80 180	50 220		

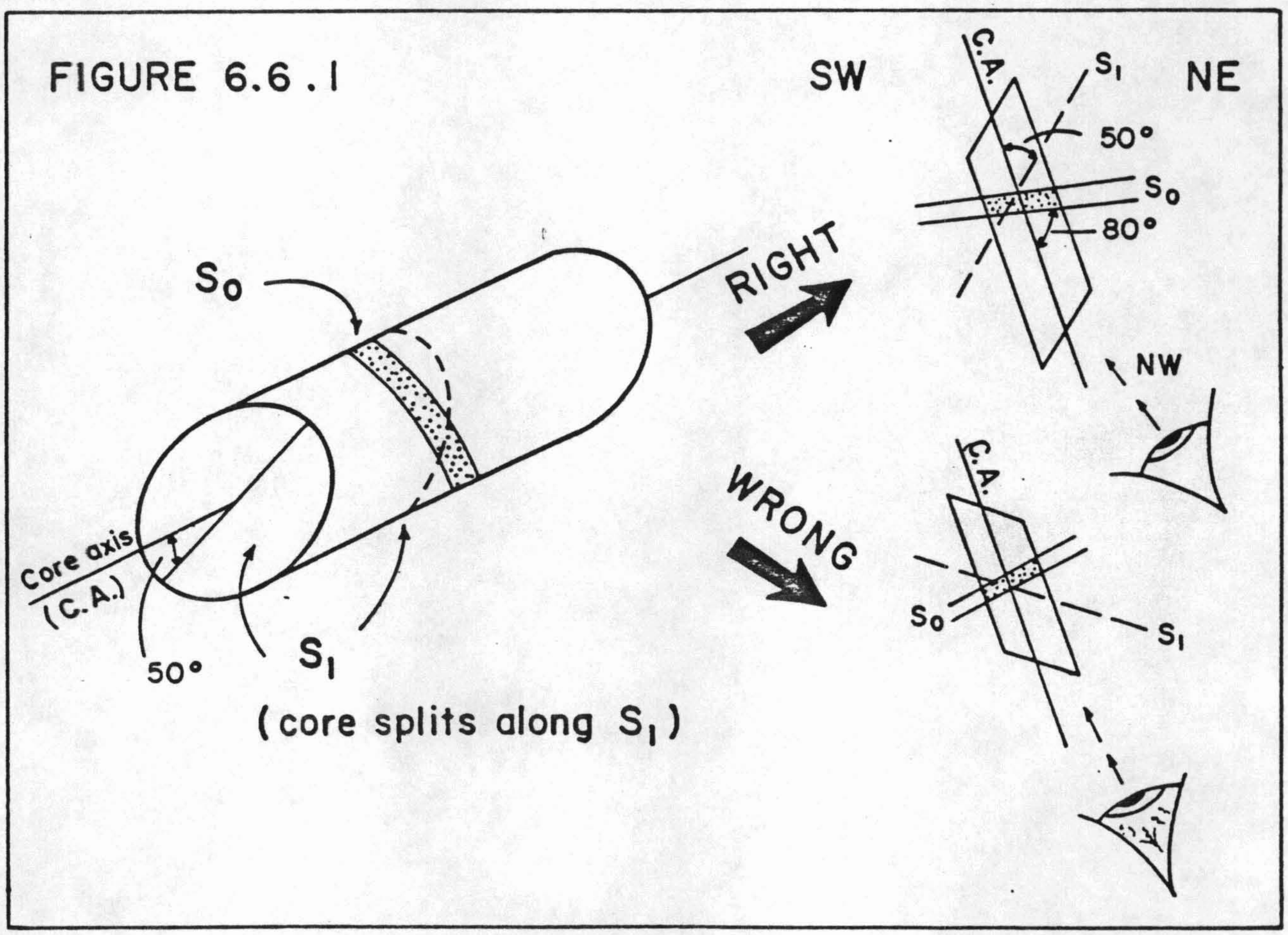
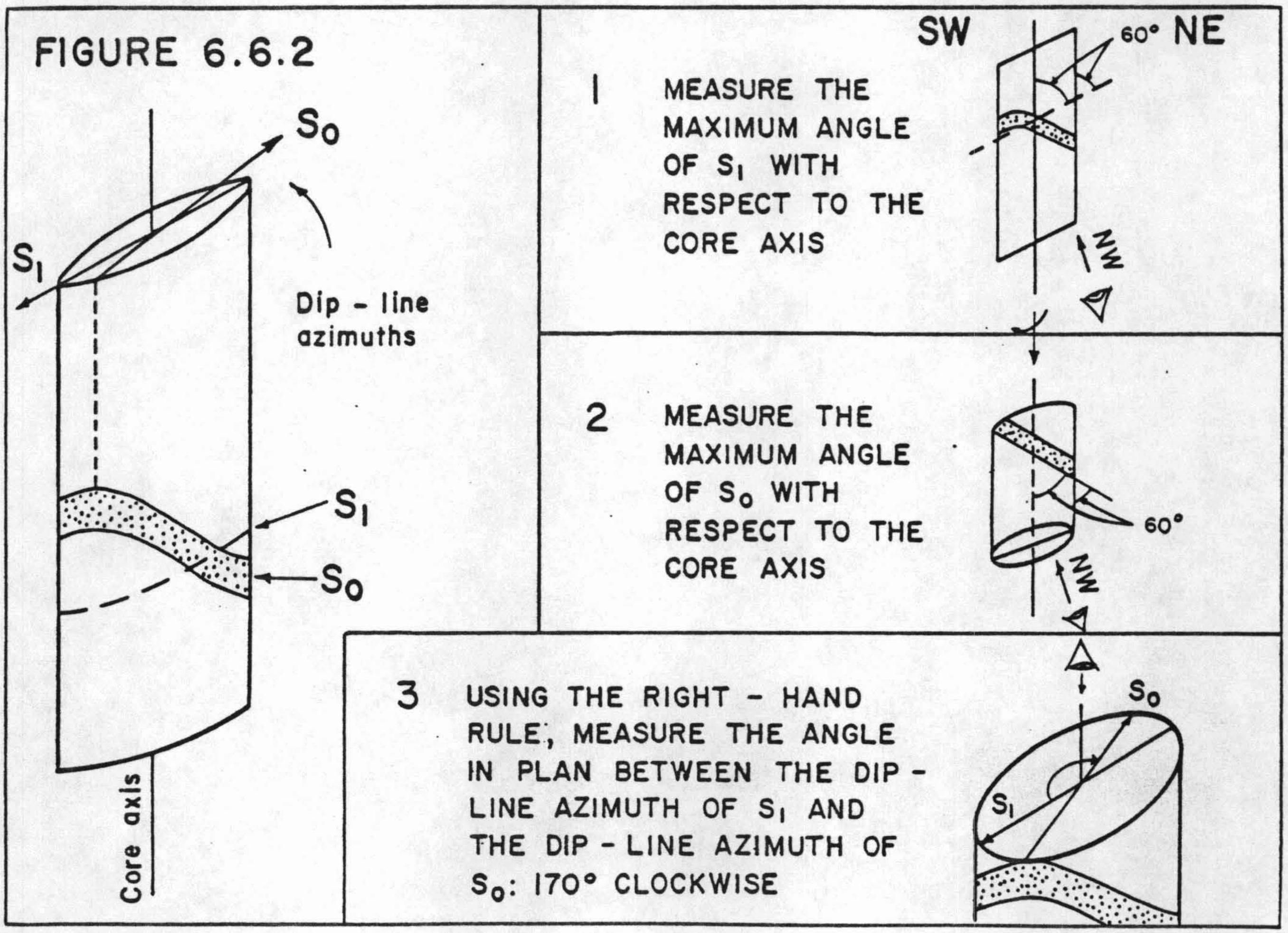


FIGURE 6.6.1

Example 2 (Cirque):

The above example is one in which S_0 and S_1 have the same strike and the drill core intersects the strata at an azimuth which is at right angles to this strike. If S_0 and S_1 have different strikes (plunging folds) or if the drillhole intersects strata at an azimuth oblique to the strike (very common at Cirque), then the determination of major ellipse axes becomes more complex. The following example is a relatively simple one with drill core vertical. There are three steps of measurement:



The results of these measurements would be recorded as follows:

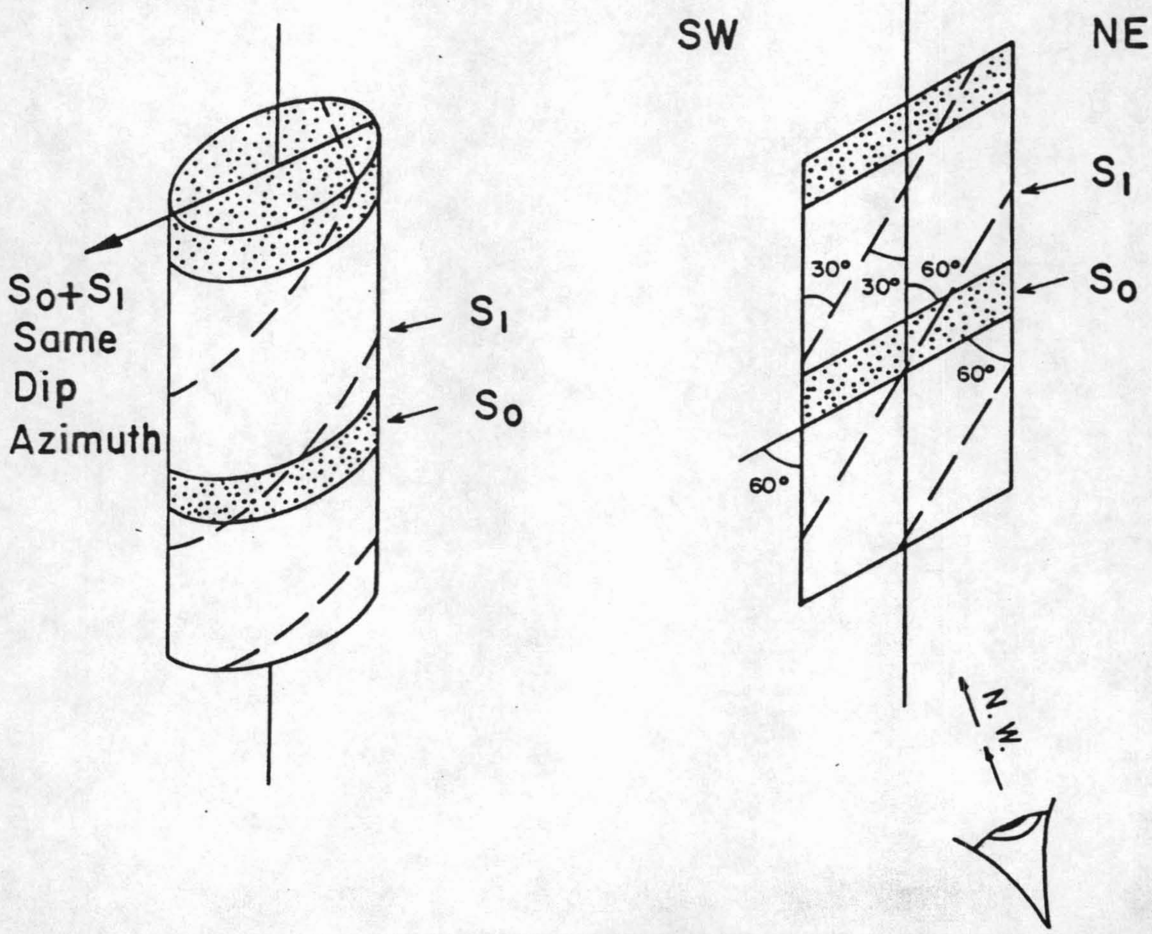
Code	From	To	Feature	Sym	S_0 Dip Direct.	S_1 Dip Direct.	S_2 Dip Direct	Description
1	10 14	16 20	22 24	26	28 32	34 38	40 44	
5		2104		Z	60 170	60 220		

In this example it is critical to know that the core is right-side up, otherwise the S_0 direction could be 190^0.

Example 3 (Cirque):

In this example, poker chip shale, the core happens to break along S_0. If S_0 and S_1 have the same major ellipse axes directions but different angles of dip:

FIGURE 6.6.3



This would be recorded as:

Code	From	To	Feature	Sym	S_0 Dip Direct.	S_1 Dip Direct.	S_2 Dip Direct	Description
1	10 14	16 20	22 24	26	28 32	34 38	40 44	
S		2304		Z	60000	30220		

7. PAGE CAMC 1981-E-4' OF LOGS: FAULT SUBFILE ("F" - TYPE DATA)

7.1 Type "F" Data Sheet - Fault Subfile

Inspection of existing drill logs reveals a wealth of fault-related information under the "Description" field of the "L" and "S" subfiles. It is extremely useful to have this information in a separate "F" subfile which would be plotted in conjuction with the structural "S"-file.

Initial logging of the "F"-file was undertaken in the Anvil District during the 1982 field season. At present the "F" file is logged on the "S" structural field sheets. In most cases the "F" sheets were not completed in the field; rather they were filled out from the "L" and "S" files for a particular drill-hole.

CAMC plotting programs currently allow for limited overlapping of the downhole "from-" and "to-" intervals when recording fault information. Two levels of fault observations are allowed. The shorter intervals (zone or point observations) must be contained entirely within the large interval (zone observation). A large interval may contain any number of small intervals as long as the small intervals do not overlap with each other or extend beyond the range of the large interval. For persons familiar with computer programming, this is equivalent to two-level, nested "do-loops". Examples of appropriate "nested" fault feature observations are shown on page 43.

An example of a modified "F" subfile log is shown on page 43. The format for the sheet is as follows:

col 1 -- card code -- "F"
This must be present for any data to be entered into the data base

col 2-8 -- drill-hole name (identifier)
Names should correspond exactly to that used for the "T"-type code

col 10-14 -- "from" depth of the fault zone
This depth is recorded to the nearest 0.1 metre (foot) with the decimal point assumed between columns 13 and 14. It is used only for zone observations (i.e. where the fault occurs over an interval in the drill-hole). With a fault point observation (fault is less than 0.1 m thick) it must be left blank.

col 16-20 -- "To" depth of the fault zone
This depth must be present. For zone observations it is the lower limit of the fault interval. For point observations it is the depth at which the observation was made. The depth is recorded in units of 0.1 metre (feet) with the decimal point assumed between column 19 and 20.

col 22-24 -- feature field
This field is used to describe the type of discontinuity present. Table 7.1 contains the features recognized. The field is left justified. Modifiers are to be placed to the left of the feature to avoid confusion with the "recovery" field.

col 26 -- recovery field
Recoveries are tabulated in column 26. The conventions for this column are presented in Table 7.2.

col 28-44 -- "orientation" fields
Orientations of the fault zones are recorded in columns 28-44. Because they are planar observations, orientations are measured with respect to the S_x (R.F.E.). Columns 28-32 are reserved for the upper contact of the fault zone; columns 34-38 contain point observations within the fault zone; columns 40-44 are reserved for the fault orientation at the lower contact of the fault zone. If the fault zone is subparallel to the R.F.E. then this information is recorded by writing 99 999 in columns 28 - 32. If the upper or lower contacts of the fault zone are subparallet to the R.F.E., this is recorded by writing 99 999 in columns 28 - 32 and/or 40 - 44, respecively.

col 45 -- "description" field
This field is used for any further qualitative description of the fault interval.

7.2 Feature Field (columns 22-24)

Table 7.1 and 7.2 contains the different features and modifiers to be used in this field. Most of the terms are self-explanatory; a few warrant some additional description.

DDH F.A.G.A.0.6.8 (2 … 8) **Cyprus Anvil Mining Corp.** Page ________ of ________

Structural Log Date: ________ Logged By: ________

Code (1)	From (10–14)	To (16–20) (AT)	Feature (22–24)	REC (26)	UPPER S₀ Dip Direct. (28–32)	INTERVAL S₁ Dip Direct (34–38)	LOWER S₂ Dip Direct (40–44)	Description
F		6448	R					rubble
F		11090	1G					minor gouge
F	11220	11240	B1G					broken w/ minor gouge
F	11260	11350	F					fault zone
F	11270	11275	3G	6				heavily gouged — recovry 0.3/0.5
F	11280		1G					minor gouge
F	11290	11300	2B	9				broken core
F	11300	11330	2R					moderately rubbled
F		11340	1B					slightly brken
F	11390	11400	1G		99999			upper contact // S_2
F	11450	11455	3G			99999		heavily gouged - internal fltn // S_2
F	11475	11500	NNN					no core - met. test sample
F	5250	5360	BRG					brken w/ rubble and gouge
F	68120	68134	R					rubble
F	75107	75119	XF?				450010	4A bxa
F		7570	R					rubble

note nested interval

Synonyms for broken core include blocky or fractured.

Rubble refers to pebbles or chips. It is considerably more broken than "poker chip" core.

Gouge obviously refers to mud and/or extremely broken core. It denotes brittle failure.

Sheared refers to core which has undergone recognizable strain but remains coherent. Typically it contains an anastomosing foliation which may or may not have associated slickensides.

Fault is a term with minimal constraints. Further it is not very descriptive. A more descriptive term should be used if at all possible.

Ductile breccia refers to a situation where there is a ductility contrast between minerals or interbanded rock units during deformation. It refers to augen of more competent minerals within a foliated matrix. In the Anvil area it would be most noticeable within the sulphide zones.

TABLE 7.1

Fault Features

Main Feature		Degree
Broken core	= B	1 = weak, minor, slight(ly)
Rubble	= R	2 = moderate
Gouge	= G	3 = strong, largely, high(ly), very dominant(ly)
Sheared	= S	? = questionable
Fault	= F	
Brittle breccia	= X	
Ductile breccia	= D	
Quartz-calcite vein	= Q	
Joints	= J	
Poker chippy	= T	
Mislatch	= M	
Cave	= C	
No core	= N	
Poor recovery	= P	
No recovery	= NP	
No core sampled for tests	= NNN	
Crackle breccia	= XQ	

TABLE 7.2

RECOVERIES

0	=	0 - 10 %
1	=	10 - 20 %
2	=	20 - 30 %
3	=	30 - 40 %
4	=	40 - 50 %
5	=	50 - 60 %
6	=	60 - 70 %
7	=	70 - 80 %
8	=	80 - 90 %
9	=	90 - 100%

8. PAGE CAMC1981-E-5 OF LOGS: ASSAY SAMPLES

8.1 Type "P" Data Sheet - Assay Log (Sample Location)

This field sheet is used to record the depth and sample number of specimens from the drill core that have been taken for assay. The sample is always taken over an interval denoted by the from-depth and the to-depth. The format of the logging sheet is shown below:

col 1	--	card code "P"
col 2-8	--	drill-hole identifier which must be the same as used on the header card (type "T") for this drill-hole
col 10-14	--	from depth. This depth is recorded in units of 0.1 metres (feet) with the decimal point assumed between columns 13 and 14.
col 16-20	--	to-depth. This depth is recorded in units of 0.1 metres (feet) with the decimal point assumed between columns 19 and 20. Both the from-depth and the to-depth must be present. The actual location of the sample is taken to be at the midpoint of the sample interval.
col 22-26	--	sample number of the specimen sent for assaying. The assay results are recorded on a separate data card. The sample number is an integer value only. Steps have been taken to assure unique numbers for each property.
col 28-30	--	Sample interval (i.e. difference between FROM and TO depths). This is recorded in units of 0.1 metres (feet) with the decimal point assumed between columns 29 and 30.
col 32-34	--	recovered length of sample. This is recorded in units of 0.1 metres (feet) with the decimal point assumed between columns 33 and 34.

col 36-40 -- lithostratigraphic code of the sample material (see chapter 5; appendices I, II). Entries in this space are to be left justified to allow for a maximum number of possible modifiers.

col 42 -- description. continued lithostratigraphic code modifiers and/or brief description of feature in the drill core. This field may also contain whole rock specific gravity measurements for the assay interval. Page 49 contains an example of measureed specific gravities for the assay samples.

DDH EG82C01 **Cyprus Anvil Mining Corp** Page 18 of 20

Logged by WJR / CWJ

ASSAY LOG (SAMPLER'S COPY) Date July 4/82 Sampled by

CODE	FROM	TO	SAMPLE	INTR.	REC (m)	UNIT	DESCRIPTION	S.G.
P	9552	9566	104401	14	14	DBBSI		4.36
P	9566	9582	104402	16	16	DGLBT	K visible ZnS	2.96
P	9582	9594	104403	12	12	DBBXP	I	4.14

9. PAGE CAMC1981-E-6 OF LOGS: RESEARCH SAMPLES

9.1 Type "H" Data Card-Research Sample Field Sheet

The sixth page of the drill logs is optional. It is used to record samples taken for research purposes: thin sections, palaeontology, etc. A suggested format, which allows computerization, is given below. H is suggested as the code.

9.2 Research Sample Logs

On the following two pages are examples of Research Sample and Thin Section logs that should be started for each sample while in the field. Later these pages will be collated into a registry of research orientated samples.

DDH ______ 2 … 8

Cyprus Anvil Mining Corp.
Research Samples

Page ______ of ______

Date: ______ Sampled By: ______

Code	From	To	No.	Unit	Purpose
1	10 … 14	16 … 20	22 … 24	26 … 30	

RESEARCH SAMPLE LOG

PROJECT: ________________

STATION: ________________

DDH: ________________ DEPTH: ______________

HAND SAMPLE:

THIN SECTION:

POLISHED SECTION:

POLISHED THIN SECTION:

ANALYSIS:

PROBE:

XRD:

ISOTOPE:

FOSSIL:

STAINED:

OTHER:

COMMENTS:

THIN SECTION LOG

PROJECT: ____________

STATION: ____________ DESCRIBED BY: ____________

DDH: ____________ DEPTH: ____________ DATE: ____________

UNIT: ____________

ROCK NAME: ____________

HAND SAMPLE:

PURPOSE:

	EST.	POINT CT.

COMMENTS:

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APPENDIX I

January 1983[3]

DETAILED STRATIGRAPHY MASTER[1]

GATAGA AREA (KECHIKA TROUGH)[2]

SYMBOL	COLOUR	UNIT	LITHOLOGY
RECENT			
OB			- Undivided overburden
OB_{SC}			- Soil - C - horizon or scree
OB_{RG}			- River gravel
OB_{TL}			- Till
LATE TERTIARY - Normal Faulting			
—— U	935		- Tectonic breccia of lithology designated in first four spaces.
—— F	935		- Graphitic shear and gouge zone of lithology designated in first four spaces.
—— Q	938		- Quartz - carbonate veins.
CRETACEOUS TO EARLY TERTIARY - Laramide Orogeny			
F_2	(feature)		- Second phase kink folds
F_1	(feature)		- First phase Laramide folds
S_2	(feature)		- Second phase crenulation cleavage
S_1	(feature)		- First phase axial planar cleavage
TRIASSIC (TR)			
TR_{ML}	905		- Marl: shaly limestone, limestone to dolostone, buff to light grey weathering thinly irregularly bedded with abundant Monotis.
TR_{RC}	932		- Chert: irregularly ribbon bedded with large composite nodules, graphitic partings.
TR_{SH}	946		- Shale: brown-grey to black, silty.
WARNEFORD FORMATION (DM_W)			- Upper Devonian to Mississippian sandstones to conglomerates.
DM_{WC}	944		- Conglomerate: chert granule to pebble, also breccia, varicoloured, black to light silvery-grey weathering.
DM_{WQ}	944		- Quartzarenite: black, light grey weathering, siliceous, graphitic, laminated, could be ≡ DC_S .
DM_{WR}	941		- Shale with sandstone interbeds: shale is soft, grey, silty, thick bedded, laminated, weathers rusty brown. Sandstones are pyritic quartzarenites, laminated and ripple cross-laminated, rusty and orange weathering.
DM_{WP}	934		- Porcellanite: ribbon bedded black chert, overlying DM_{WBX} in Fluke-Pie belt, locally contains large limestone concretions; DM_{WPS} when ribbon-bedded but not hard enough to be a porcellanite. Also contains a thin laminated/blebby barite horizon.
DM_{WB}	944		- Shale: dark grey to black, gunsteel to rusty weathering, hard, graphitic, competent coring but phyllitic lenticular cleavage when weathered; common intraformational breccia (DM_{WBI}) and/or chert and quartz sand to pebble conglomerate lenses (DM_{WBX}) ≡ DA_{GH}, DA_{PH}, DM_{WC}. Can be planar bedded with dark grey speckled pyritic siliceous siltstone laminae (DM_{WBT}).
DM_{WM}	928		- Barite: unmineralized, massive, laminated, grey, grades to blebby barite in silty shale interbedded with conglomerates.

SYMBOL	COLOUR	UNIT	LITHOLOGY
CONUNDRUM SILTSTONE (DC)			
DC_S	945	Conundrum siltstone	- Siltstone to breccia: light grey, speckled-weathering, soft, variably calcareous, pyritic, diffusely laminated, local individual burrows, exposed on Elf to Pie. DA_{SH} may be fine-grained equivalent.
AKIE SHALE (DA)			- Upper Devonian to Mississippian soft shales and siltstones above mineralized barite.
DA_{PS}	951	Pinstriped shale	- Shale: dark brown-grey, light grey to rusty brown weathering, silty, distinctly laminated, $\equiv DC_S$.
DA_{GH}	951	Graphitic shale [4]	- Shale: dark grey to black, rusty grey weathering, graphitic, competent, moderately hard, laminated, with discontinuous pyrite laminae, irregular planar cleavage; $\equiv DA_{PH}$, $\equiv DM_{WB}$.
DA_{SH}	945	Phyllitic siltstone [4]	- Siltstone: light to dark grey, speckled, variably calcareous, planar to irregularly laminated ± burrow mottled; phyllitic-graphitic lenticular cleavage; $\equiv DA_{SF}$, possibly finer facies of DC_S.
DA_{PH}	943	Phyllitic shale [4]	- Shale: light to medium grey, rusty brown weathering, faintly laminated, soft, phyllitic, lenticular to slaty cleaved, $\equiv DA_{PF}$, $\equiv DM_{WB}$, $\equiv DA_{GH}$. Locally contains thin pyritic siltstone lenses and beds which weather bright orange.
GUNSTEEL FORMATION (DG, DB)			- Upper Devonian to Mississippian siliceous shales and siltstones enclosing mineralization.
DG_{GS}	910	Undivided Gunsteel	- Shale: dark grey to black, silvery-grey (gunsteel) weathering, laminated.
DG_{CH}	956	Hanging wall ribbon chert [4]	- Porcellanite: dark grey to black, silvery grey weathering, ribbon bedded (< 5cm), with graphitic shale partings and interbeds, below DA_{PH} or DM_{WB}; $= DM_{WP}$, $= DG_{CF}$.
DG_{BH}	928	Hanging wall barren barite [4]	- Barite: unmineralized, laminated, white to grey; grading to blebby, calcareous, in black porcellanite; within DG_{CH}. Contains large limestone concretions; possibly distinguished from DG_{BF} by distinct striped-weathering laminae.
DG_{TH}	912	Hanging wall poker chip shale [4]	- Shale to porcellanite: dark grey, silvery-grey weathering, distinct graphitic partings < 3 cm apart, commonly < 1 cm; laminated, commonly with siltstone laminae (DG_{THT}); $\equiv DG_{PR}$, DB; $= DG_{TF}$.
DG_{CM}	931	Chert marker beds	- Porcellanite: dark grey to black, massive to ribbon bedded, commonly with quartz veining, in one to several beds up to several meters thick, within DG_{PR}.
DG_{PR}	910	Pregnant shale	- Shale to porcellanite: dark grey to black, silvery-grey to rusty weathering, silty; bedding thicker than 3 cm, massive to laminated; planar slaty cleavage in outcrop; ± nodules and laminae of barite, pyrite and calcite $\equiv DG_{TH}$, $\equiv DB_{BS}$; $= DG_{FP}$. Includes DG_{TH} on Fluke. On Cirque note creamy pyrite and discontinuous ("streaky") pyrite laminae (DG_{PRY}) in Pregnant shale below ore, (e.g. 81C07) and distal to ore (e.g. R. Creek and Cirque Creek). On Elf, pregnant shale in immediate footwall of mineralization has 3-10 mm ovoid blebs of calcite + quartz in sausage-like chains. On Fluke and Elf, footwall Pregnant shale is interbedded with D_{PL}.
DG_{LB}	916	Laminar banded pyrite	- Pyrite: > 10%, very fine-grained, very finely laminated, interlaminated with siliceous ± calcareous shale and siltstone in beds 1 to 20 cm thick; can have visible galena and sphalerite (DG_{LBE}); within DG_{PR}; $\equiv$ DB.
DG_{SX}	908	Siltstone breccia	- Siltstone: light to medium grey, laminated to burrow mottled, dolomitic, siliceous, common intraformational breccia (DG_{SXI}) and conglomerate, confined to mineralized horizon; similar to S_{SS}; breccia has massive sulphide matrix in places.
DG_{DL}	916	Distinctly laminated unit	- Rhythmically interlaminated on a scale of about 1 cm: siliceous siltstone, fine-grained laminated pyrite, black siliceous shale ± blebby barite.
DB_{PY}	916	Pyrite	- Pyrite: > 80%, laminated, fine-grained, framboidal.
DB_{VN}	929	Veins and sweats	- Barite: medium to coarsely crystalline, common galena in strain shadows and irregular patches, in veins and sweats. Barite talus slopes at Cirque and Elf showings are dominated by this unit.

SYMBOL	COLOUR	UNIT	LITHOLOGY
GUNSTEEL FORMATION (continued)			
DB_{ES}	926	Elf Showing	- Galena + sphalerite + calcite + barite + pyrite; massive, interlaminated, >8% Pb + Zn over 10 cm intervals; interbedded with Pregnant shale on a scale of 1 to 10 cm; grades into DG_{LBE}. Intersections on South Cirque (81C37) are temporarily assigned to this unit.
DB_{MS}	925	Massive sulphides	- Pyrite, sphalerite ± galena: massive, medium to coarsely crystalline, ± minor barite.
DB_{SB}	922	Sulphides-barite	- High grade sphalerite, galena and pyrite with 20% < barite < 60%; crudely laminated, crystalline.
DB_{BX}	918	Barite breccia	- Intraformational breccia of barite, often with siltstone fragments, locally coarse crystalline, with <40% irregular laminae and matrix of pyrite + barite + shale.
DB_{BS}	918	Barite-sulphides	- Barite with <40% pyrite and < 10% Pb + Zn: finely crystalline, irregularly to discontinuously interlaminated; minor barite nodules > 1 cm diameter.
DG_{TF}	912	Footwall poker chip shale[4]	- Shale to porcellanite: dark grey to black, silvery weathering, distinct graphitic partings < 3 cm apart, commonly 1 cm, internally finely laminated, common siltstone laminae = DG_{FT}, DG_{TH}.
DG_{BF}	928	Footwall barren barite[4]	- Barite: unmineralized, laminated, light grey, rusty weathering, grading to blebby (BFB), calcareous, in black porcellanite, within DG_{CF}. Contains large limestone concretions (BFA), cephalopods, = DG_{BH}.
DG_{CF}	956	Footwall ribbon chert[4]	- Porcellanite: dark grey to black, silvery-grey weathering, ribbon bedded (< 5 cm), with graphitic shale interlaminae and partings = DG_{CH}.
AKIE SHALE (DA)			- Devonian to Mississippian soft shales and siltstones below mineralized barite.
DA_{PF}	943	Phyllitic shale[4]	- Shale: grey weathering, soft, phyllitic, lenticular to platy cleaved = DA_{PH}, ≡ DA_{GF}.
DA_{GF}	951	Graphitic shale[4]	- Shale: dark grey to black, rusty grey weathering, graphitic, competent, moderately hard, laminated, with discontinuous pyrite laminae, irregular planar cleavage. ≡ DA_{PF}.
DA_{SF}	945	Phyllitic siltstone[4]	- Siltstone: light to dark grey, speckled, variably calcareous, planar to irregularly laminated ± burrow mottled, with phyllitic-graphitic lenticular cleavage partings; = DA_{SH}.
DA_{SS}	911	Silty shale	- Silty shale: dark brown-grey, rusty brown weathering, medium hard to soft, thick bedded, massive to indistinctly laminated, with spruce-bark flaky cleavage interbedded with Conundrum siltstone and extending northeast just above D_{KR} on Fluke and Pie claims. May grade laterally into DG_{PR}.
GUNSTEEL FORMATION (DG)			- Devonian siliceous shales just above S_{SS} and below phyllitic shale, e.g. 78C04, 79C16, 80C03. Where phyllitic shale absent; below footwall ribbon chert.
DG_{FT}	912	Footwall poker chip	- Shale: black, graphitic, poker chip partings, with common light grey siltstone beds = DG_{TF}.
DG_{FP}	910	Footwall pregnant shale	- Shale to porcellanite: black, massive coring, with common speckled siltstone, creamy and discontinuous pyrite laminae; interbedded with D_{PC}: = DG_{PRY}.
KWADACHA and PESIKA REEFS (D_{KR})			- Lower to Middle Devonian Limestone, zero to >200 m thick.
D_{KR}	919		- Limestone: grey, thick massive bedded, fossiliferous - stromatoporoid, coral, crinoid debris with some fossils in growth position.

— UNCONFORMITY —

SYMBOL	COLOUR	UNIT	LITHOLOGY
PAUL RIVER FORMATION (D_P)			- Lower (LD_P) to Middle (D_P) Devonian shale containing coarse clastic rocks and/or graptolites; lateral equivalent of D_{KR} and LD_{PQ}.
D_{PC}	944		- Conglomerate: chert and siliceous siltstone fragments in siliceous black shale, could ≡ LD_{PX}. e.g. DDH 78C04 can be logged as DG_{FPX}.
D_{PP}	930		- Porcellanite: ribbon bedded, with fossiliferous limestone breccia beds; overlies D_{KR} east of Cirque; probably ≡ DG_C.
D_{PL}	919		- Shale: black, with thin fossiliferous limestone turbidites, commonly with one and two-holed crinoids, common as interbeds in bottom of Pregnant Shale.
LD_{PX}	906		- Silstone to breccia: thin to thick graded beds, clasts of chert, quartz sand, pyritic siltstone and shale chips, interbedded with black ribbon porcellanite (D_{PP}??) and black graphitic shale. Elf and Fluke, could be DM_{WBX}.
DOLOMITIC QUARTZITE FORMATION (LD_P)			
LD_{PQ}	919		- Quartzite: grey, dolomitic, graded beds, fossil debris, rhythmically interbedded with black graptolitic shale, mapped on east side of Gataga Trough only.
			— LOCAL UNCONFORMITY —
SILURIAN SILTSTONE (S_S)			- Middle to Late Silurian, top of Road River group, 275 to more than 500 m thick.
S_{SX}	942		- Siltstone: medium grey, dolomitic, laminated, includes intraformational breccia - commonly at gradational to sharp contact between Devonian shale and S_S - paleo soil?
S_{SC}	930		- Porcellanite: black, massive, within S_{SH}, generally central Silurian siltstone.
S_{SQ}	942		- Sandstone: quartzose, tan weathering, with coral and sponge fragments; rhythmic, massive graded beds; interbedded with black siltstone and shale, generally at or near top of Silurian Siltstone on east and west sides of Kechika Trough. May be Lower Devonian (≡ LD_{PQ}).
S_{SB}	928		- Barite: unmineralized, light grey, laminated, slightly calcareous.
S_{SL}	905		- Limestone: grey weathering, laminated or burrow mottled, silty. Calcareous versions of S_{SSL} + S_{SSW}. There may be several horizons within Silurian siltstone.
S_{SS}	942		- Siltstone: light orange-weathering, dolomitic, with common burrows, feeding fans and burrow mottling (S_{SSW}). Can be distinctly planar laminated (S_{SSL}).
S_{SH}	941		- Siltstone: shaly, recessive, laminated, variably calcareous, includes black chert lenticles (S_{SHC}), occurs at top, middle and bottom of Silurian siltstone. ≡ S_{RCO}
			— LOCAL UNCONFORMITY —
SILURIAN CHERT (S_{RC})			- Early to Middle Silurian, Road River group, zero to more than 30 m thick.
S_{RC}	932	Silurian chert	- Porcellanite (S_{RCS}): streaky white-striped, ribbon bedded, with black calcareous graptolitic shale partings, some dolomitic siltstone (S_{RCO}) and large limestone concretions (S_{RCA}). Complete sequence is S_{RL}, S_{RLO}, S_{RC}, S_{RCO}, S_{RCA}, S_{SHLC}.
SILURIAN LIMESTONE (S_{RL})			- Early Silurian (Llandovery), Road River group, zero to more than 100 m thick.
S_{RL}	902	Silurian limestone	- Limestone: grey, rhythmic, flaggy to blocky bedded, calcisiltite and fine calcarenite turbidites with graptolitic shale interbeds.
			— LOCAL UNCONFORMITY —

SYMBOL	COLOUR	UNIT	LITHOLOGY
SHALE FACIES OF ROAD RIVER GROUP (O_R)			- Early to Late Ordovician
O_{RC}	933	Ordovician chert	- Porcellanite: black (+ white?), ribbon bedded, with limestone concretions, mainly NW of Driftpile Creek.
O_{RG}	967	Ordovician graptolitic gunsteel	- Shale: black, silvery-grey (gunsteel) to black weathering, variably calcareous, graptolitic, minor chert, local barite horizons (O_{RGB}). Thickness ranges from zero to > 100 meters.
O_{RQ}	966	Ordovician quartzite	- Quartzose sandstone turbidites with minor dolomite, carbonate fossil fragments and graptolitic shale interbeds; mainly east of Akie Trough. Unit OR_5 of Cecile and Norford (1979), up to 180 m thick.
O_{RP}	948	Rusty shale	- Shale: black, rusty and buff to light grey weathering, graptolitic, commonly calcareous. Unit OR_4 of Cecile and Norford (1979), 30-40 m thick.
O_{RD}	937 stripes	Dolostone	- Dolostone: orange weathering, silty, laminated, possibly algal, interbedded with and overlying Ospika Volcanics in the Paul River Valley area, < 100m.
O_{RS}	964	Silty shale	- Silty shale to siltstone: dark grey, tan to pink weathering, laminated, graptolitic, variably calcareous, contains the Ospika Volcanics (O_V), and dolomite breccia (O_{SK}). Unit OR_3 of Cecile and Norford (1979).
O_{RL}	906	Ordovician limestone	- Limestone: rhythmically flaggy bedded with graptolitic shale interbeds; yellow weathering. Unit OR_2 of Cecile and Norford (1979).
O_{RN}	936	Nodular Shale	- Shale: black, buff to light grey weathering, limestone nodules, local nodular barite (O_{RNB}), interdigitates with Upper Kechika. Unit OR_1 of Cecile and Norford (1979).
OSPIKA VOLCANICS (O_V)			- Ordovician, in Road River shales, generally OR_S.
O_{VF}	937		- Mafic to andesitic flows, locally amygdaloidal and phyllitic, massive flows to variolitic pillows.
O_{VX}	937		- Mixed volcanic and shale intraclast breccia and conglomerate.
O_{VT}	937		- Tuff and breccia: orange-weathering, flattened, siliceous (O_{VTS}) to highly calcareous (O_{VTK}).
O_{VG}	937		- Gabbroic-textured mafic sills within Kechika Group and Road River shales.
SKOKI FORMATION (O_{SK})			
O_{SK}	905		- Dolostone: grey-buff laminated flaggy beds and intraformational breccia (O_{SKL}, O_{SKI}) or interbedded graptolitic shale and dolostone breccia with abundant corals and crinoids (O_{SKX}) or massive bedded fossiliferous dolostone -- Skoki Formation (O_{SKM}). ≡ O_{RS}.
KECHIKA FORMATION ($ЄO_K$, O_K)			
O_{KU}	920		- Limestone: yellowish-tan weathering, grey-brown, nodular, argillaceous, cliff-forming.
$ЄO_{KL}$	920		- Limestone: distinctly bedded, grey, phyllitic, nodular, argillaceous.
CAMBRIAN (LЄ, MЄ, Є)			- Early to Late Cambrian basinal facies.
$Є_{SS}$	936		- Shale: siliceous, silty, laminated, pinkish-buff weathering, resembles O_{RS}, encloses $MЄ_{LR}$.
$MЄ_{LR}$	905 (striped)	Spectre Peak Reefs	- Limestone: light grey, aphanitic with tiny tribolites - Middle Cambrian Reefs.
$LЄ_{AQ}$	916		- Rhythmically interbedded orange-weathering dolostone with Archeocyathids and quartzarenite with Skolithos.

MODIFIERS

≡	Homotaxial to
=	Lithology similar to, but stratigraphic position different from
A	Calcite nodules, includes Septarian nodules
B	Barite nodules
C	Chert nodules
D	Dolomitic
E	Visible sphalerite ± galena laminae
F	Highly sheared - when alone denotes FAULT clay to sandy gouge
G	Carbonaceous or graphitic
H	Interbedded with shale
I	Intraformational breccia/conglomerate
J	Volacaniclastic or tuffaceous
K	Calcareous
L	Laminated i.e. bedding $<$1 cm. (thin bedded = $<$3 cm.)
M	Massive bedded
N	Nodular pyrite
O	Silty if shale; shaly if siltstone; i.e. silty shale!
P	< 10% Laminar banded pyrite, characteristic of Pregnant Shale above and adjacent to barite-sulphides.
Q	Quartz veining
R	Disseminated pyrite
S	Siliceous
$\not{S}$	Non-siliceous
T	Siltstone laminae and thin beds (calcareous and non-calcareous) - usually turbidites
U	Tectonic (U-) Breccia - when alone denotes FAULT breccia
V	Veins of pyrite ± sphalerite ± galena ± calcite ± barite
W	Bioturbated ("WORMY")
X	With conglomerate and/or sandstone interbeds
Y	Thin streaky pyrite laminae and individual creamy to diffusely disseminated pyrite laminae - characteristic of footwall and distal barren Pregnant shale
Z	Disseminated sphalerite

1. In stratigraphic order wherever possible - see Facies Relationships and General Stratigraphy diagrams. After Cecile and Norford (1979), Fritz (1979), Gabrielse (1975, 1981), Gabrielse et al (1977) and Taylor et al (1979).
2. This is for the entire Gataga Area; not all units are present in each property.
3. Conversion chart correlating this with 1978, 1979, 1980, 1981 and 1982 legends - follows.
4. The hanging and foot wall versions of these members can be lithologically indistinguishable, in which case they are referred to as DG_C, DG_B, DG_T, DA_P, DA_{GR}, DA_S.

CORRELATION CHART OF LITHOSTRATIGRAPHIC COLUMNS

GATAGA AREA - 1978 to 1983

1983	1982	1981	1980	1979	1978
				Logs updated to 1983	Logs updated to 1983
RECENT					
OB	OB	OB			
OB_{SC}	OB_{SC}	OB_{SC}			
OB_{RG}	OB_{RG}	OB_{RG}			
OB_{TL}	OB_{TL}	OB_{TL}			
LATE TERTIARY					
—— U	—— U	—— U			
—— F	—— F	—— F			
—— Q	—— Q				
CRETACEOUS TO LATE TERTIARY					
F_2 (feature)	F_2				
S_2	S_2				
F_1	F_1	F_1 (feature)			
S_1	S_1	S_1 (feature)			
TRIASSIC					
TR_{NL}	TR_{NL}	(TR_{CB}	10C	—	—
		(TR_{NL}	10B	—	—
TR_{RC}	TR_{RC}	TR_{RC}	10D	—	—
TR_{SH}	TR_{SH}	TR_{SH}	10A	10A	—
WARNEFORD FORMATION					
DM_{WC}	DM_{WC}	DM_{WC}	DM_{CG} 9C, 9D	9C, 9D	uDM_{WG}
DM_{WQ}	DM_{WQ}	DM_{WQ}	—	—	uD_{SQ}
DM_{WR}	DA_{RS}	DM_{WS}	DM_{SS} 9A	9A	DM_{WS}
DM_{WB}	DM_{WB}	DM_{WB}	DM_{PH} 9G, 9V	7C, 8U, 8V	—
DM_{WP}	DM_{WT}	—	—	—	—
DM_{WN}	DM_{WN}	—	—	—	—

1983	1982	1981	1980		1979	1978
CONUNDRUM SILTSTONE						
DC_{S}	DC_{SH}	DM_{WT}	DM_{CS}	9E	7E	--
AKIE SHALE						
DA_{PS}	DA_{PS}	DM_{WP}	DM_{PS}	9B	7B, 9B	--
DA_{SH}	(DA_{SH}	DG_{SH}	UD_{ST}	8Y, 8B	8B	--
	(DA_{TB}	DG_{TB}	UD_{TB}	8Z	--	--
DA_{GH}	DA_{GH}	(DM_{WR}	DM_{SH}	9F	7D	--
		(DG_{GR}	UD_{GR}	8V	8V	--
DA_{PH}	DA_{PH}	DG_{PH}	UD_{PH}	8U	8U	--
GUNSTEEL FORMATION						
DG_{GS}	DG_{GS}	DG_{GS}	UD_{GS}	8W	8W	uD_{GS}
DG_{CH}	DG_{CH}	DG_{CH}	UD_{BC}	8D	8D	uD_{RC}
DG_{BH}	DB_{BH}	DG_{CHB}	UD_{BCB}	8DB	--	--
DG_{TH}	DG_{TH}	DG_{TH}	UD_{PC}	8T	--	uD_{AR}
DG_{CN}	DG_{CN}	DG_{C}	UD_{BC}	8D	--	--
DG_{PRB}	DG_{PRB}	DG_{PRB}	UD_{PR}	8SB	8D	--
DG_{PR}	DG_{PR}	DG_{PR}	(UD_{LN}	8C	8C	uD_{AR}
			(UD_{PR}	8S	8S	uD_{AR}
			(UD_{ST}	8Y 9in ore)	8Y	--
DG_{LB}	DG_{LB}	DG_{LB}	UD_{LB}	8R	8R	uD_{LB}
DG_{SX}	DG_{SX}	DG_{SX}	UD_{DC}	8X	8X	--
DG_{DL}	DG_{DL}	DG_{DL}	UD_{DL}	8Q	8Q	--
DB_{PY}	DB_{PY}	DB_{PY}	UD_{PY}	8P	8P	uD_{PY}
DB_{VN}	DB_{VN}	DB_{VN}	UD	8M	8M	--
DB_{ES}	DB_{ES}	DB_{ES}	UD_{ES}	8L	8L	--
DG_{PRV}	DB_{BPV}	DG_{PFV}	UD_{KN}	8K	--	--
DB_{MS}	DB_{MS}	DB_{MS}	UD_{MS}	8J	8K	--
DB_{SB}	DB_{SB}	DB_{SB}	UD_{SB}	8I	8I	--
DB_{BX}	DB_{BX}	DB_{BX}	UD_{BB}	8H	8H	--
DB_{BS}	DB_{BS}	DB_{BS}	UD_{BS}	8G	8G	uD_{BS}
DG_{PRY}	DG_{BP}	DG_{PR}	UD_{PR}	8S	8S	uD_{AR}
DG_{TF}	DG_{TF}	DG_{TF}	(UD_{GF}	8F	8F	--
			(UD_{TC}	8E	8E	--
DG_{BF}	DB_{BF}	(DG_{CFB}	(UD_{RCB}	8AB	8O	--
		(DB_{BA}	(UD_{BA}	8N	8N	uD_{BA}

1983	1982	1981	1980	1979	1978
GUNSTEEL FORMATION (cont'd)					
DG_{CF}	DG_{CF}	DG_{CF}	UD_{RC} 8A	8A	uD_{RC}
DG_{C}	DG_{C}	DG_{C}	—	—	—
DG_{FT}	DG_{FT}	DA_{PC}	LD_{PC} 6T	—	—
DG_{FP}	DG_{FP}	DA_{PR}	LD_{PR} 6G, 6S	6G	—
AKIE SHALE					
DA_{PF}	DA_{PF}	DG_{PF}	UD_{AP} 7C	7C	—
DA_{GF}	DA_{GF}	DG_{CF}	—	—	—
DA_{SF}	DA_{SF}	DG_{SF}	UD_{ST} 8B	8B	—
DA_{P}	DA_{P}	DG_{P}	—	—	—
DA_{G}	DA_{G}	DG_{G}	—	—	—
DA_{S}	DA_{S}	DG_{S}	—	—	—
DA_{SS}	DA_{SL}	DA_{SL}	UD_{SS} 7A	7A	uD_{SS}
CONUNORUM SILTSTONE					
DC_{SF}	DC_{SF}	—	—	—	—
KWADACHA AND PESIKA REEFS					
D_{KR}	D_{KR}	D_{KR}	LD_{L} 6D	6A	mD_{L}
PAUL RIVER FORMATION					
D_{P}	D_{P}	(—	—	6B	—
		(LD_{PS}	LD_{GR} 6A	6F	—
D_{PC}	D_{PC}	DA_{CG}	LD_{CG} 6I	None	—
D_{PP}	D_{PP}	D_{PP}	LD_{RC} 6F	6E	—
D_{PL}	D_{PL}	D_{PL}	LD_{CR} 6C	6C	—
LD_{PX}	LD_{PX}	LD_{PX}	LD_{BX} 6E	6D	—
DOLOMITIC QUARTZITE FORMATION					
LD_{PQ}	LD_{PQ}	LD_{PQ}	LD_{QZ} 6B	6H	—

1983	1982	1981	1980		1979	1978
SILURIAN SILTSTONE						
S_{SS}	S_{SS}	S_{SS}	S_{SS}	5	5	S_{SS}
S_{SX}	S_{SX}	DA_{SS}	LD_{SS}	6H	None	—
S_{SC}	S_{SC}	—	—		—	—
S_{SQ}	S_{SQ}	S_{SQ}	S_{SS}	5B, C	5A5, 5A3	—
S_{SB}	S_{SB}	—	—		—	—
S_{SL}	S_{SL}	S_{SL}	S_{SS}	5A	5B	—
S_{SS}	S_{SS}	S_{SS}	S_{SS}	5D	5A	S_{SS}
S_{SH}	S_{SH}	S_{SH}	S_{SS}	5E	5A6	—
SILURIAN CHERT						
S_{RC}	S_{RC}	S_{RC}	S_{RC}	4K	—	—
SILURIAN LIMESTONE						
S_{RL}	S_{RL}	S_{RL}	S_{L}	4J	4F, 4H	O_{LS}
ROAD RIVER ORDOVOCIAN SHALES						
O_{R}	O_{R}	OS_{RR}	OS_{RR}	4D	4A	OS_{RR}
O_{RC}	O_{RC}	OS_{RC}	OS_{RC}	4E	4G	—
O_{RG}	O_{RG}	OS_{RG}	OS_{GG}	4I	4C	—
O_{RQ}	O_{RQ}	OS_{RQ}	OS_{OZ}	4H	4E	—
O_{RR}	O_{RR}	—	—		—	—
O_{RD}	O_{RD}	OS_{RS}	OS_{SS}	4F	4B	—
O_{RS}	O_{RS}, O_{RGO}, L, K	—	—	4I, L, K, O	—	—
O_{RL}	O_{RL}	OS_{RT}	OS_{LT}	4G	4D	—
O_{RN}	O_{RN}	—	—		—	—
OSPIKA VOLCANICS			OV	3	2	O_{V}
O_{VF}	O_{VF}	O_{VF}	OV_{F}	3E	2A2 + 2B2	—
O_{VX}	O_{VX}	O_{VX}	OV_{BX}	3D	2B1	—
O_{VT}	O_{VT}	O_{VT}	OV_{T}	3B, C	2A1 + 2B1 + 2C1	—
O_{VG}	O_{VG}	O_{VG}	OV_{S}	3A	2C	—
SKOKI FORMATION						
O_{SK}	O_{SK}	O_{SK}	OS_{K}	4A, B, C	3A, B, C	—

1983	1982	1981	1980		1979	1978
KECHIKA GROUP			O_{K}	2	1	$ЄO_{K}$
O_{KU}	O_{KU}	O_{KU}	O_{KU}	2B	1B	—
$ЄO_{KL}$	$ЄO_{KL}$	$ЄO_{KL}$	O_{KL}	2A	1A	—
CAMBRIAN ROCKS						
$Є_{SS}$	$Є_{SS}$	$Є_{AS}$	LC_{AS}	1A	0A	—
$MЄ_{LR}$	$MЄ_{LR}$	$MЄ_{LR}$	MC_{L}	1C	0C	—
$LЄ_{AQ}$	$LЄ_{AQ}$	$Є_{AQ}$	LC_{AQ}	1B	0B	—

CORRELATION CHART OF MODIFIERS

GATAGA AREA - 1978 - 1983

1982-83 ALL	1980-81 ALL	1979 Unit 8	1979 Unit 7	1979 Unit 6	1979 Unit 5	1979 Unit 4	1979 Unit 3	1979 Unit 2	1978 NIL
A	A	3				3			
B	B, E	5, 3				4, 3			
C	C	5, 3				3			
D	D								
E									
F	F	8	3						
G	G	9		3					
H	H				6				
I	I	1		5	7	8			
J	V							3	
K	K	6	2	1		2	2		
L	L	7			4	6			
M	M				5			2	
N	N	5			2				
Ø	Ø, J	0	6, 7						
P	P					5			
Q	Q								
R	R								
S	S	2	4	2		1	1		
$	$								
T	T	3	1	6					
U	U					7			
V									
W	W				1				
X	X								
Y	Y		5	4	2	5			
Z									

Appendix II

ANVIL RANGE LITHOSTRATIGRAPHIC CODE

Eagle Prismacolor No.	Code	Unit	Formation	Group / Assemblage	Age
938	11Q	BULL QUARTZ VEIN, POD		Intrusive Rocks	L U Cretaceous
932	11G	PYROXENITE AND SERPENTINIZED EQUIVALENTS		Intrusive Rocks	
937	11F	SMOKEY QUARTZ - FELDSPAR PORPHYRY		Intrusive Rocks	
934	11E	PORPHYRITIC HB - BIO QUARTZ DIORITE		Intrusive Rocks	
956	11D	EQUIGRANULAR HB - BIO QUARTZ DIORITE		Intrusive Rocks	
939	11C	QUARTZ MONZONITE PEGMATITE DIKES		Intrusive Rocks	
929	11B	PORPHYRITIC, BIOTITE - QUARTZ MONZONITE		Intrusive Rocks	
928	11A	MUSCOVITE - BIOTITE GRANODIORITE		Intrusive Rocks	
942	10	UNDIFFERENTIATED POLYMICTIC CONGLOMERATE	Pelly Formation		
917	9H	GRAYWACKE, SHALE, MINOR CONGLOMERATE		Triassic Flysch Assemblage	
918	9G	THICKBEDDED SILTSTONE		Triassic Flysch Assemblage	
940	9F	FLYSCH FACIES GRAYWACKE AND SHALE		Triassic Flysch Assemblage	
914	9E	BASALTIC GRAYWACKES AND ARGILLACEOUS CHERTS		Triassic "Magmatic Arc" Assemblage	
909	9D	BASALT FLOWS		Triassic "Magmatic Arc" Assemblage	
968	9C	VARICOLORED RIBBON CHERTS AND NON - CALCAROUS PHYLLITE		Triassic "Magmatic Arc" Assemblage	
961	9B	INTERBEDDED CARBONACEOUS LIMESTONE AND GRAPHITIC PHYLLITE		Triassic "Magmatic Arc" Assemblage	M. Triassic U. Triassic
925	9A	RUSTY WEATHERING, FINE GRAINED, POLYMICITIC CONGLOMERATE		Triassic "Magmatic Arc" Assemblage	
907/950	8G	ECLOGITE		Vangorda Creek Ultramafic Complex	
907/931	8F	BASALT		Vangorda Creek Ultramafic Complex	
933	8E	HARZBURGITE		Vangorda Creek Ultramafic Complex	
965	8D	DIABASE		Vangorda Creek Ultramafic Complex	
907	8C	GABBRO		Vangorda Creek Ultramafic Complex	
924	8B	RODINGITE		Vangorda Creek Ultramafic Complex	
933	8A	SERPENTINITE		Vangorda Creek Ultramafic Complex	
931	7A	MASSIVE AND FRAGMENTAL BASALT FLOWS		Anvil Range Group	
905	6I	CALC - SILICATE PHYLLITE / ARGILLITE	Rose Creek Formation	Earn Group	
912	6H	TUFF TO TUFFACEOUS CHERT	Rose Creek Formation	Earn Group	
930	6G	MAROON CHERT	Rose Creek Formation	Earn Group	
951	6F	VARICOLOURED PHYLLITIC CHERT / QUARTZITE	Rose Creek Formation	Earn Group	
919	6E	MARBLE / PHYLLITIC MARBLE	Kalzas Formation	Earn Group	U Pa L Permian
940	6D	BARITE - 2		Earn Group	
921	6C	CHERT GRANULE / PEBBLE CONGLOMERATE / QUARTZITE	Crystal Peak Formation	Earn Group	
942	6B	BARITE - 1		Earn Group	
962	6A	CARBONACEOUS TO GRAPHITIC, GREY SILICEOUS ARGILLITE / PHYLLITE	Pisswick Pond Formation	Earn Group	M Devonian M U Devonian
962	5I	CARBONACEOUS TO GRAPHITIC, ARGILLITE / PHYLLITE	Vangorda Formation	Kechika Group	
911	5H	AMYGDALOIDAL CHLORITIC PHYLLITE	Vangorda Formation	Kechika Group	
949	5G	VARIABLY CALCAREOUS, GRAPHITIC PHYLLITE	Vangorda Formation	Kechika Group	
945	5F	CHLORITIC PHYLLITE	Vangorda Formation	Kechika Group	
904	5E	PHYLLITIC MARBLE AND SILICATED MARBLE	Vangorda Formation	Kechika Group	
910	5D	LAMINARLY BANDED, VARIABLY CALCAREOUS, CHLORITIC PHYLLITE	Vangorda Formation	Kechika Group	
908	5C	METABASITE	Vangorda Formation	Kechika Group	
920	5B	CALCAREOUS MUSCOVITE CHLORITE ± BIOTITE PHYLLITE	Vangorda Formation	Kechika Group	
936	5A	VARIABLY CALCAREOUS, GRAPHITIC PHYLITE HOST TO UNIT 4	Vangorda Formation	Kechika Group	
923	4	GRUM, VANGORDA, DY, FIRTH, SWIM, SB, SEA SULPHIDE DEPOSITS UNDIFFERENTIATED		Kechika Group	
916	3I	GRAPHITIC QUARTZITE IN NON - CALCAREOUS PHYLLITE / SCHIST	Mt Mye Formation	Kechika Group	
913	3H	TUFFACEOUS CALC - SILICATE PHYLLITE / SCHIST (ASSOCIATED WITH 3D)	Mt Mye Formation	Kechika Group	
941	3G	NON - CALCAREOUS, MUSCOVITE - CHLORITE ± BIOTITE PHYLLITE / SCHIST, UNDIFFERENTIATED	Mt Mye Formation	Kechika Group	
906	3F	MARBLE AND SILICATED MARBLE	Mt Mye Formation	Kechika Group	
963	3E	GRAPHITIC PHYLLITE / SCHIST	Mt Mye Formation	Kechika Group	
913	3D	CALC - SILICATE PHYLLITE / SCHIST	Mt Mye Formation	Kechika Group	
908	3C	METABASITE	Mt Mye Formation	Kechika Group	
946	3B	CHLORITIC PHYLLITE / SCHIST	Mt Mye Formation	Kechika Group	
912	3A	TRANSITION ZONE WITH UNIT 1	Mt Mye Formation	Kechika Group	M Ordovician / M Cambrian
923	2	FARO SULPHIDE DEPOSIT UNDIFFERENTIATED			
901	1G	MARBLE AND SILICATED MARBLE	Faro Formation	Anvil Group	
908	1F	METABASITE	Faro Formation	Anvil Group	
967	1E	GRAPHITIC SCHIST	Faro Formation	Anvil Group	
947	1D	CARBONACEOUS, BIOTITE - MUSCOVITE - ANDALUSITE SCHIST	Faro Formation	Anvil Group	
943	1C	QUARTZO - FELDSPATHIC, BIOTITE MUSCOVITE GNEISS / SCHIST	Faro Formation	Anvil Group	
902	1B	TACTITE AND SILICATED MARBLE	Faro Formation	Anvil Group	
943	1A	UNDIFFERENTIATED UNIT 1	Faro Formation	Anvil Group	
907/950	0G	ECLOGITE		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	
933	0F	SERPENTINIZED ULTRAMAFIC METABASITE		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	
908	0E	METABASITE		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	Hadrynian ?
966	0D	GRAPHITIC PHYLLITE / SCHIST		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	Devono-Mississippian ?
948	0C	VARIABLY CALCAREOUS MUSCOVITE - CHLORITE ± BIOTITE PHYLLITE / SCHIST		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	
915	0B	VARIABLY CARBONACEOUS, CALCAREOUS QUARTZITES / GRITS		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	
915	0A	UNDIFFERENTIATED UNIT 0		Mt Pike Group (Klondike Schist ?) Englishman's Group ?	

Appendix II

DY DEPOSIT AREA

LITHOSTRATIGRAPHIC CODE

Intrusive Rocks

Unit	No.	Code	Description	Group
Unit 11	928	11 A	Muscovite-biotite granodiorite	Anvil Batholith
	929	B	Porphyritic, biotite-quartz monzonite	Anvil Batholith
	939	C	Quartz monzonite pegmatite dikes	Anvil Batholith
	956	D	Equigranular hb-bio quartz diorite	Dioritic Suite Related to Anvil Batholith
	934	E	Porphyritic hb-bio quartz diorite	Dioritic Suite Related to Anvil Batholith
	937	F	Smokey quartz-feldspar porphyry	Dioritic Suite Related to Anvil Batholith
	932	G	Pyroxenite and serpentinized equivalents	Dioritic Suite Related to Anvil Batholith
	938	Q	Bull quartz vein, pod	
		1	Gneissose LS - tectonite	Anvil Batholith Varieties
		2	Gneissose L - tectonite	Anvil Batholith Varieties
		3	Equigranular	Anvil Batholith Varieties
		4	K - feldspar phenocrysts	Anvil Batholith Varieties
		5	Garnet-quartz-monzonite	Anvil Batholith Varieties
		6	Plagioclase phenocrysts	Diorite Porphyry Varieties
		7	Plagioclase + biotite phenocrysts	Diorite Porphyry Varieties
		8	Plagioclase + biotite + hornblende phenocrysts	Diorite Porphyry Varieties
		9	Strongly altered	
		0	Normal	

Intrusive Contact

Vangorda Formation

Unit	No.	Code	Description
Unit 5	936	5 A	Variably calcareous, graphitic phyllite (hosts Unit 4)
	920	B	Calcareous muscovite-chlorite ± biotite phyllite
	908	C	Metabasite
	910	D	Laminarly banded, variably calcareous, chloritic phyllite
	904	E	Phyllitic marble and silicated marble
	945	F	Chloritic phyllite
	949	G	Variably calcareous, graphitic phyllite
	911	H	Amygdaloidal chloritic phyllite
	962	I	Carbonaceous to graphitic argillite/phylite
		1	Siliceous
		2	Carbonaceous
		3	Calcareous
		4	Altered, pyritic (white mica envelope)
		5	Banded/laminated
		6	Non-calcareous
		7	Tuffaceous
		8	Chloritic
		9	Sulfide-bearing
		0	Normal

Conformable Contact

DY Deposits

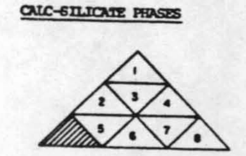
Unit	No.	Code	Description	Group
Unit 4	922	4 A	Sulfide-bearing, ribbon-banded, graphitic quartzite	Banded
	915	B	Pyrite-free quartzite (may contain base metal sulfides)	Banded
	916	C	Base metal-poor, pyritic quartzite	Banded
	942	D	Base metal-bearing, pyritic quartzite	Banded
	918	E	Massive pyritic sulfides	Banded
	923	F	Buckshot facies, massive sulfides	Massive
	928	G	Baritic facies, massive sulfides/sulfates (>10% $BaSO_4$)	Massive
	924	H	Pyrrhotitic facies, massive sulfides	Massive
		J	Non-pyritic, massive sulfides/oxides	Massive
	921	K	Carbonate-bearing, massive pyritic sulfides	Massive
	914	L	Sulfide-bearing siliceous to tuffaceous exhalite	Massive
		1	Siliceous	
		2	Coarse, porphyroblastic pyrite-bearing	
		3	Fine pyrite/marcasite-bearing	
		4	Sphalerite and/or galena-bearing	
		5	Carbonaceous	
		6	Barite-bearing	
		7	Pyrrhotite-bearing	
		8	Magnetite-bearing	
		9	Chalcopyrite-bearing	
		0	Normal	

Conformable Contact

Mt. Mye Formation

Unit	No.	Code	Description
Unit 3	912	3 A	Transition zone with Unit 1
	946	B	Chloritic phyllite/schist
	908	C	Metabasite
	913	D	Calc-silicate phyllite/schist
	963	E	Graphitic phyllite/schist
	906	F	Marble and silicated marble
	941	G	Non-calcareous, muscovite-chlorite ± biotite phyllite/schist, undifferentiated
	913	H	Tuffaceous calc-silicate phyllite/schist (associated with 3D)
	916	I	Graphitic quartzite in non-calcareous phyllite/schist
		1	Siliceous
		2	Non-calcareous
		3	Calcareous
		4	Altered, pyritic (white mica envelope)
		5	Banded/laminated
		6	Sulfide-bearing
		7	Tuffaceous
		8	Chloritic
		9	Carbonaceous
		0	Normal

CALC-SILICATE PHASES



L. U. CRETACEOUS

INTRUSIVE ROCKS

KECHIKA GROUP

M. CAMBRIAN/M. ORDOVICIAN

APPENDIX III: DRILL-HOLE IDENTIFICATION CODES, 1981

Anvil District:	
GRUM	EA 81 G
	FA 81 A, U
Between GRUM and VANGORDA	
	FA 81 AX__ (leave space for only 1 to 9 holes)
VANGORDA	EA 81 V
	FA 81 V
	FA 81 VX__ (outside Vangorda, only 1 - 9 holes)
DY	EA 81 X
SWIM	EA 81 S
FARO	EA 81 F
Tenas District:	
	ET 81 T
Gataga District:	
CIRQUE	EG 81 C
FLUKE	EG 81 F
ELF	EG 81 E
Coal Properties:	
TULAMEEN	EC 81 T
CARMACKS	EC 81 C
ROSS RIVER	EC 81 R
Pelly Properties:	
MM	EP 81 MM
Shannon Creek District:	
SHANNON CREEK	ES 81 SH__ (only 1 - 9 holes)
Anmac District:	
KLUNK	RIP
HY	EM 81 H (Exploration MacMillan)
SUN - MOON	EM 81 S