CONODONT BIOSTRATIGRAPHY
of the
CIRQUE and FLUKE CLAIMS
NORTHEASTERN BRITISH COLUMBIA

Omineca Mining District

Cirque Claims
NTS: 94F/06,11
Latitude: 57° 31'N
Longitude: 124° 50'W

Fluke Claims
NTS: 94F/07
Latitude: 57° 24'N
Longitude: 124° 54'W

by

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for

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submitted
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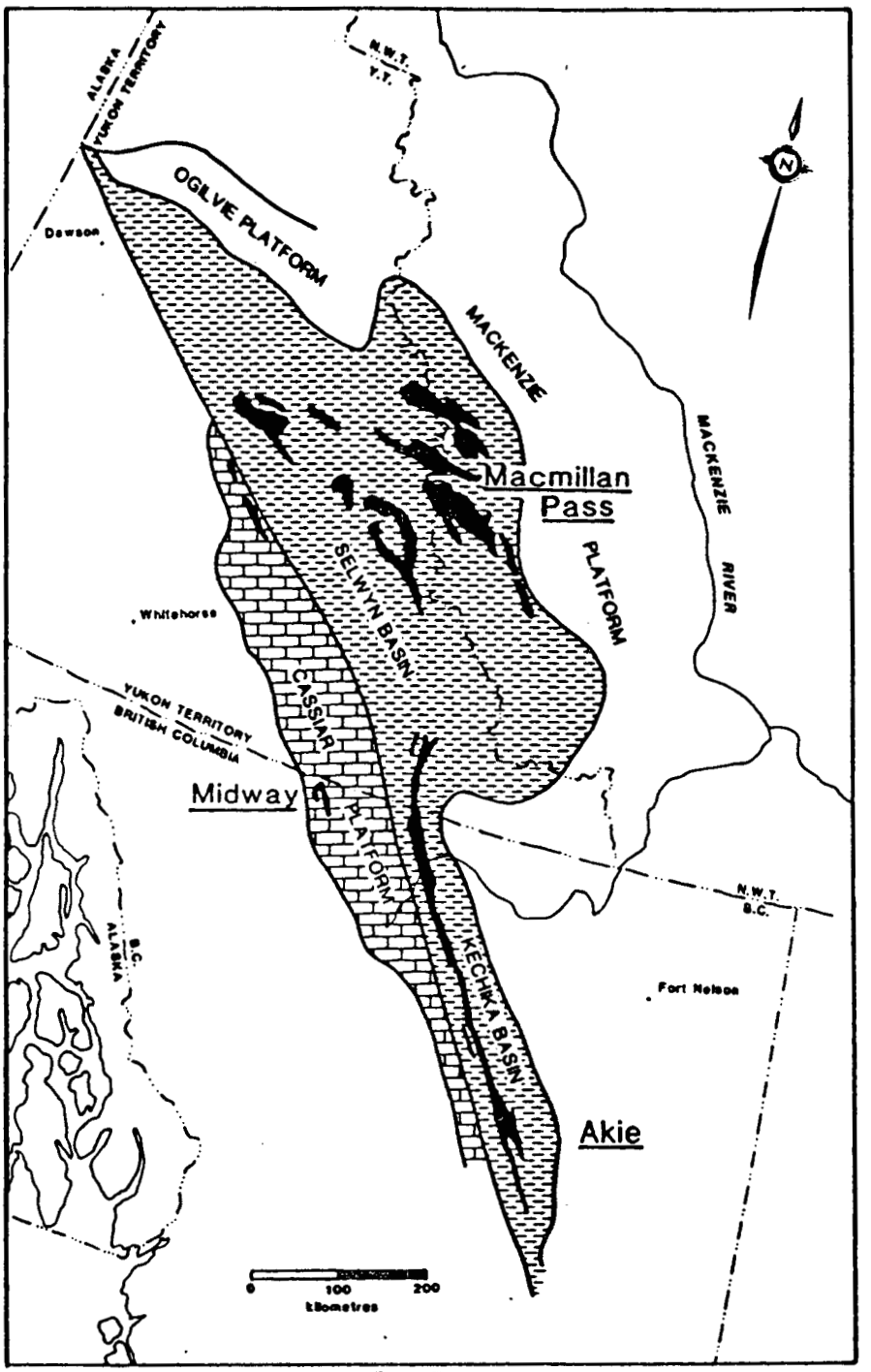
INTRODUCTION

The CIRQUE and FLUKE stratiform barite-sulphide deposits of the Akie District are hosted by the Devonian - Mississippian Earn Group (figs. 1 & 2). Conodont biostratigraphy has been successfully applied to determine the ages of similar deposits at Macmillan Pass, where they are of Late Devonian, middle Frasnian age, and in the Gataga - Driftpile area, where they are middle Famennian (Lower **rhomboidea** and **marginifera** zones) in age (fig. 1) (Irwin, 1990). In an attempt to date the CIRQUE and FLUKE deposits, fifty samples were collected by Insley from calcareous strata at the CIRQUE and FLUKE properties in August 1989.

Forty three limestone and seven calcareous mudstone samples were collected from surface outcrop and drill core material. The sample weight ranged from 150 grams to four kilograms, the average being one kilogram. Samples were dissolved in a buffered 10% glacial acetic acid solution for seven days, after which the insoluble residues were washed and sieved through 1 mm and 0.09 mm mesh screens. The fine fraction was concentrated magnetically and through the use of sodium polytungstate (specific gravity 2.80) a density separation was performed. After the separation, the denser fraction (>2.80) was examined and hand-picked for conodonts. Due to the large amount of framboidal barite and sulphide material in many samples, particularly those from the CIRQUE property, large amounts of material had to be examined and picked for conodonts.



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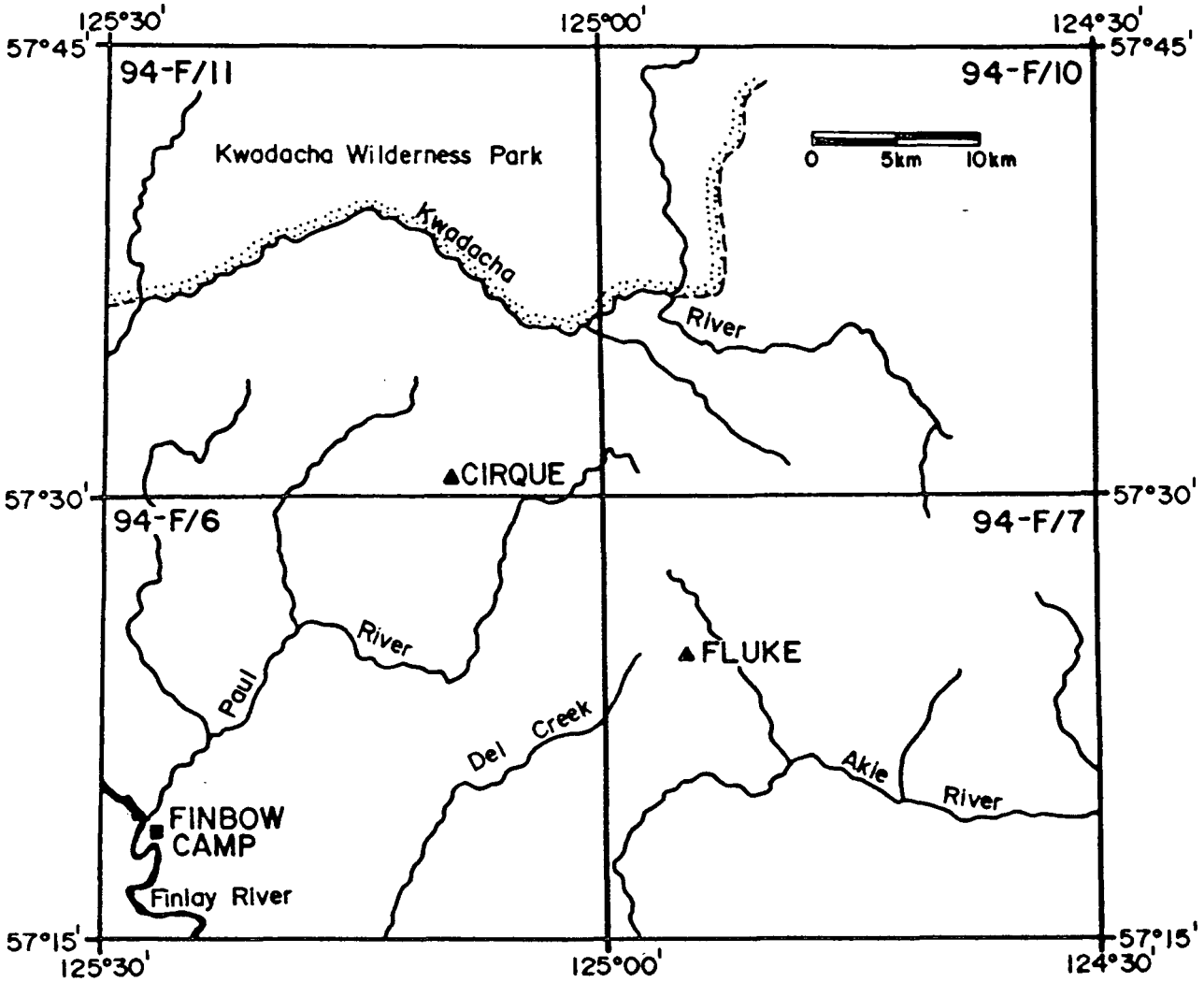
STRATIFORM MINERALIZATION SELWYN & KECHIKA BASINS

Date: 90/06/22	Drawn by: H.D.S.
Drawing No. AK-AK-90-009	Figure No. 1



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CIRQUE & FLUKE CLAIMS LOCATION MAP

Date: 90/06/20	Drawn by: H.D.S.
Drawing No. AK-AK-90-010	Figure No. 2

Prior to this report, an occurrence of the ammonite **Ponticeras** (Jefferson et al., 1983) below the CIRQUE mineralisation suggested only that the stratiform mineralisation was at least Frasnian in age. No direct age dating was available for the FLUKE mineralisation.

All stratigraphic relationships and nomenclature discussed in this report is based on information obtained from Insley (1990) (fig. 3).

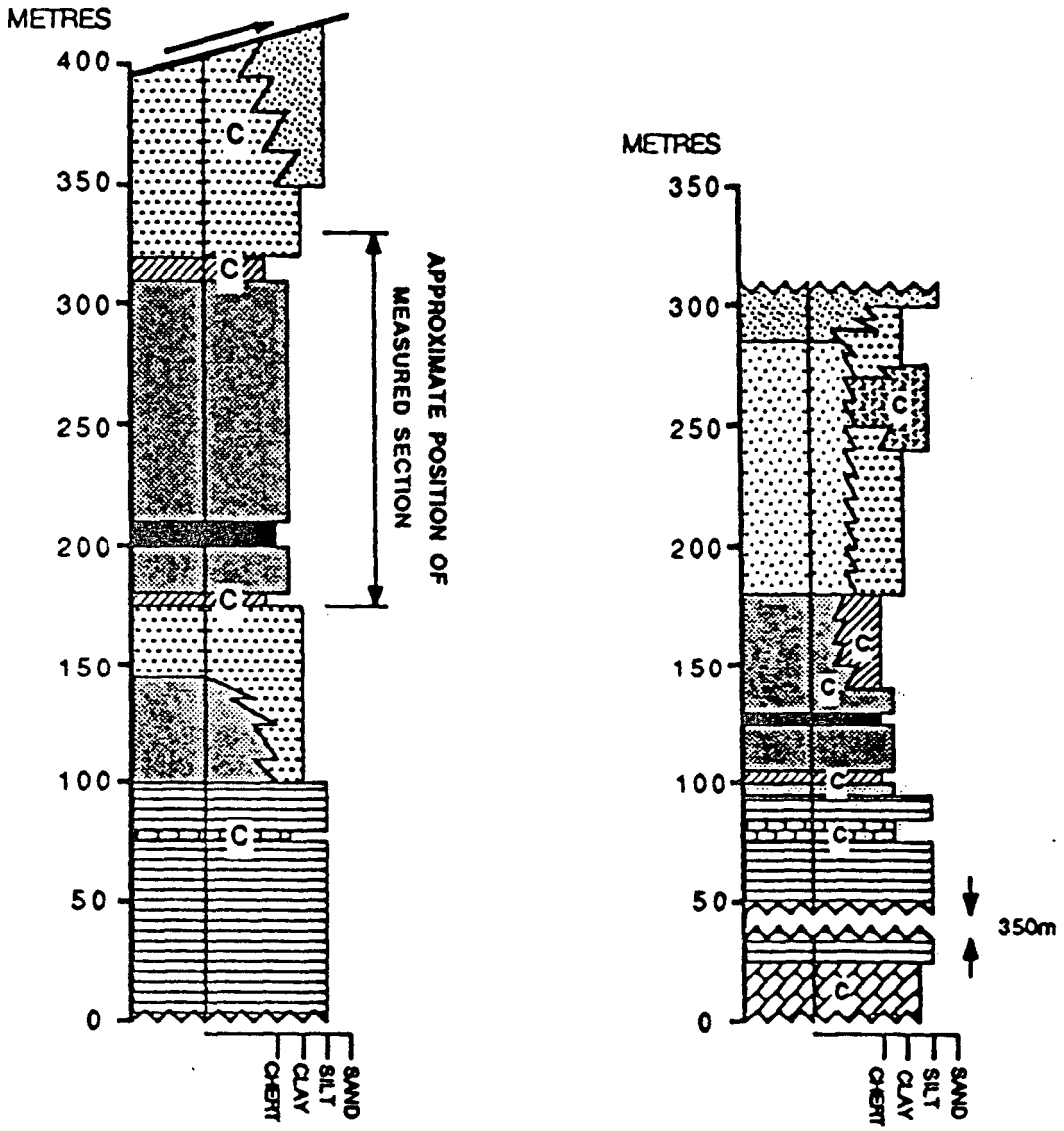
BIOSTRATIGRAPHY

A. Cirque Property

Twenty three carbonate samples were collected from the CIRQUE area (figs. 2, 4 & 5, tables 2 & 3, appendix A) for conodont analysis. The majority of the samples were collected from limestone within the upper and lower units of the 'Pregnant' shale facies of the Gunsteel Formation. Large quantities (30 - 50% by volume) of fine grain framboidal sulphide characterised the 'Pregnant' shale sample residues. Six of the thirteen productive samples collected within the CIRQUE area contained age diagnostic conodont faunas (C7, C11, C16, C22, C30, and C34). All of the conodonts collected had a colour alteration index (CAI) value of 5, indicative of temperatures of 300°C+.

GOSSAN THRUST SHEET, CIRQUE

FLUKE CLAIMS
(COMPOSITE SECTION)



C - Relative stratigraphic position of conodont samples

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STRATIGRAPHIC SECTIONS SHOWING CONODONT SAMPLE LOCATIONS CIRQUE & FLUKE CLAIMS

Date: 90/06/21	Drawn by: H.D.S.
Drawing No. AK-AK-90-011	Figure No. 3

LEGEND FOR STRATIGRAPHIC SECTIONS

EARN GROUP

Conundrum Siltstone (DCS)

Poorly bedded, soft, variably calcareous, spckled siltstone.

Warneford Formation (DMW)

Sandstone, conglomerate and minor shale (DMWR (Cirque) and DMWQ (Fluke)).

Intraformational shale chip breccia (DMWB).

Akie Formation (DA)

Finely laminated, soft shale with phyllitic sheen (DAP)

Gunsteel Formation (DG)

Black porcellanite with minor siliceous shale (DGC (Cirque) and DGCH (Fluke)).

Massive to thin bedded, non-calcareous, black siliceous shale containing abundant nodules - 'pregnant' shale (DGPR)..

Stratiform mineralisation: sphalerite and laminated pyrite (Fluke). Barite-sphalerite-galena-pyrite mineralisation (Cirque).

ROAD RIVER GROUP

'Silurian' siltstone unit (Sss)

Grey and buff weathering crinkle laminated limestone
Buff-brown weathering dolomitic siltstone and mottled bioturbated mudstones and silty mudstone.

'Silurian' Limestone unit (SRL)

Grey, rhythmic bedded, flaggy limestone with thin shale partings.

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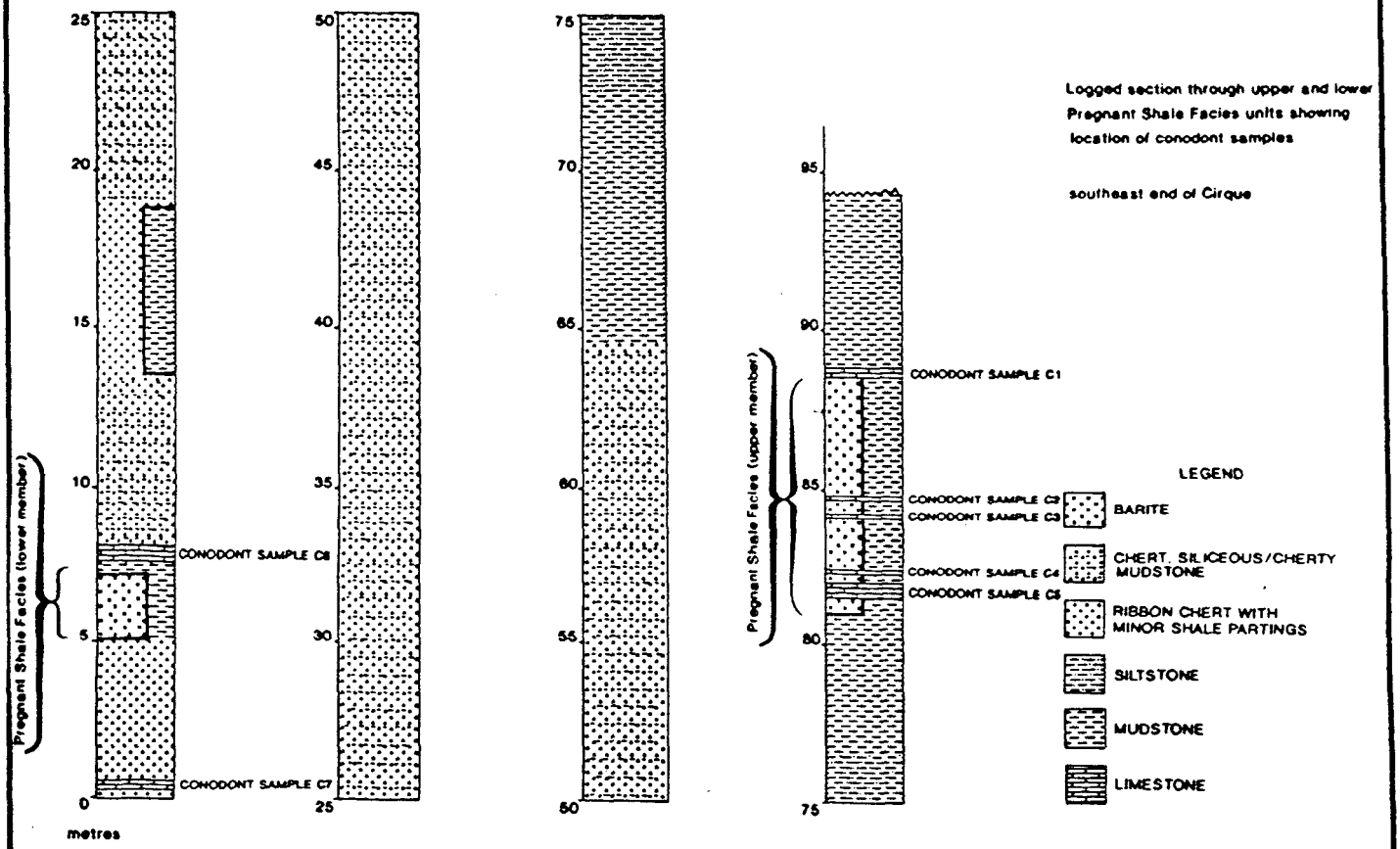
STRATIGRAPHIC SECTIONS LEGEND for (Figure 3)	
Date: 90/06/21	Drawn by: H.D.S.
Drawing No. AK-AK-90-012	Figure No. 3a

Sample C34 (table III) was collected from nodular limestone within an Ordovician shale unit at the 215.0 m level in drill hole 80-C-13. This fauna includes **Drepaniostodus** sp. (pl. 1, figs. 7 & 8) which is indicative of the Ordovician.

Sample C16 (fig. 4, table II) was collected from the 'Silurian' Siltstone unit within the Road River Group. The well preserved Early Silurian, Llandovery fauna includes **Astropentagnathus** cf. **A. irregularis** Mostler (pl. 1, figs. 1 & 5), **Astropentagnathus** sp. (pl. 1, fig. 2), **Distomodus** sp. (pl. 1, fig. 4), **Pterospathodus celloni** (pl. 1, fig. 9), **Oulodus? fluegli** (Walliser) (pl. 1, fig. 13), and mazuelloids (pl. 1, figs. 18 & 19). This fauna is the same age as conodont faunas identified by Orchard, in Norford & Orchard (1985) above the stratiform sulphide mineralisation at Howards Pass.

Sample C7 (fig. 5), collected within an non-mineralised foot wall below the CIRQUE mineralisation (Pigage, pers. comm.), contains **Palmatolepis rugosa ampla** Muller (pl. 2, fig. 18) which ranges from within the Lower **postera** Zone through middle Upper **expansa** Zone of the late Famennian (table I). This sample represent the youngest Famennian fauna identified within the CIRQUE area. Assuming the stratigraphy within this area is correct, the CIRQUE mineralisation is younger than any stratiform barite-lead-zinc mineralisation identified within the Gataga area, or elsewhere in the Earn Group. If the section is overturned, however, sample C7 provides a youngermost age limit



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DETAIL LITHOLOGY BETWEEN SAMPLE LOCATIONS LC12 & LC13

Date: 90/06/22	Drawn by: H.D.S.
Drawing No. AK-AK-90-013	Figure No. 5

for the CIRQUE mineralisation, which would correlate directly with other Gataga - Driftpile mineralisation.

Sample C11 (fig. 4, table II), collected from a limestone concretion within the upper member of the 'Pregnant' shale facies of the Gunsteel Formation, contains **Polygnathus glabra** subsp.(pl. 1, fig. 10) which is indicative of middle through late Famennian.

Sample C22 (fig. 4, table II), collected from a limestone concretion within the porcellanite unit of the Gunsteel Formation, contains **Mehlina** sp. (pl. 2, fig. 16), **Palmatolepis** sp. indet., and **Icriodus** sp. indet. This fauna provides a broad Famennian age for the porcellanite unit.

Sample C30 (table III), collected from nodular limestone within the Gunsteel Formation, porcellanite unit, contains **Palmatolepis** sp. indet., **Polygnathus** sp. indet., and **Icriodus** sp. indet. which are indicative of the Famennian.

B. Fluke Property

Twenty seven samples were collected from the FLUKE area for conodont analysis (appendix B), seventeen of which were from surface outcrops of the Earn Group and the Road River Group (fig. 6, table IV). A further ten drill core samples were collected from drill holes 80-F-01, 80-F-02, and 80-F03 (fig. 6, table V).

Earn Group samples were collected mainly from limestone concretions within the Gunsteel Formation, from within the porcellanite units both at the base (DG_{CM}) and overlying (DG_{CH}) the 'Pregnant' shale facies. Samples were also collected from limestone within the underlying Road River Group and the overlying Conundrum siltstone (Insley, 1990). Fourteen of the seventeen productive samples collected within the FLUKE area contain age diagnostic conodonts. All of the conodonts collected from the FLUKE property had a colour alteration index (CAI) value of 5, indicative of temperatures of 300°C+.

Sample F2, collected from a limestone concretion at the top of the 'Silurian' dolomitic siltstone unit, includes **Icriodus steinachensis** Al-rawi (pl. 2, fig. 5) which is indicative of the Early Devonian, Lochkovian.

Sample F14, collected from the Kwadacha limestone, contains **Polygnathus linguiformis** subsp., **Polygnathus xylus** subsp., and other **Polygnathus** ssp. This fauna is indicative of the Middle Devonian, probably Early Givetian.

Ten productive samples (F1, F4, F5, F6, F11, F12, F13, F16, F25, and F27) contain conodont faunas indicative of the middle and upper Famennian (table I, Appendix B). Sample F1, collected from an unidentified unit, and samples F11, F12, and F13, collected from limestone concretions within the porcellanite unit (DG_{CM}) of the Gunsteel Formation, include **Palmatolepis marginifera marginifera** Helms (pl. 2, figs. 1 & 3). **Palmatolepis**

marginifera marginifera Helms is the zonal index subspecies for the middle Famennian **marginifera** Zone. Samples F11, F12, and F13 also include **Palmatolepis minuta minuta** Branson & Mehl (pl. 2, fig. 14), **Palmatolepis glabra pectinata** Ziegler (pl. 2, figs. 8 & 10), and **Palmatolepis glabra distorta** Branson & Mehl (pl. 2, figs. 7 & 9). These samples, collected from near the base of the 'Pregnant' shale facies (table IV) provides a lower age limit of middle Famennian, **marginifera** Zone for the FLUKE mineralisation.

Sample F6, collected from an unidentified unit, is confined to the Lower **marginifera** Zone by the occurrence of **Palmatolepis** cf. **P. quadrantinodosa inflexoidea** Ziegler with **Palmatolepis marginifera marginifera** Helms (pl. 2, figs. 2 & 4) and **Palmatolepis glabra lepta** Ziegler & Huddle (pl. 2, fig. 11).

Sample F4 includes **Palmatolepis rugosa trachytera** Ziegler (pl. 2, fig. 17), **Palmatolepis rugosa ampla** Muller, and **Palmatolepis gracilis gracilis** Branson & Mehl (pl. 2, fig. 13) which are indicative of upper Famennian, **postera** Zone. Sample F5, containing **Palmatolepis perlobata postera** Ziegler (pl. 2, fig. 20) and **Palmatolepis rugosa** subsp. (pl. 2, fig. 19) is also indicative of upper Famennian, **postera** Zone. These two samples, unlocated and from an unidentified unit (Insley, 1990) represent the youngest conodont faunas identified in the FLUKE Area. These faunas are direct correlatives of sample C7 at the CIRQUE property.

Sample F16 includes **Palmatolepis perlobata schindewolfi** Muller (pl. 2, fig. 6) which is indicative of the middle and upper

Famennian. Sample F16, collected from concretions within the porcellanite unit overlying the 'Pregnant' shale unit (Insley, 1990), provides an upper age limit of late Famennian.

Sample F25, collected from 'Pregnant' shale facies nodular limestone within barite-pyrite mineralisation at 195.75 m level in drill hole 80-F-03, includes **Palmatolepis glabra lepta** Ziegler & Huddle which is indicative of the middle Famennian.

Sample F27, from the 'Pregnant' shale facies at level 160.2 m in drill hole 80-F-03 83 cm below barite mineralisation, includes **Palmatolepis** sp. and **Polygnathus** sp. (pl.2, fig. 15) of the Famennian.

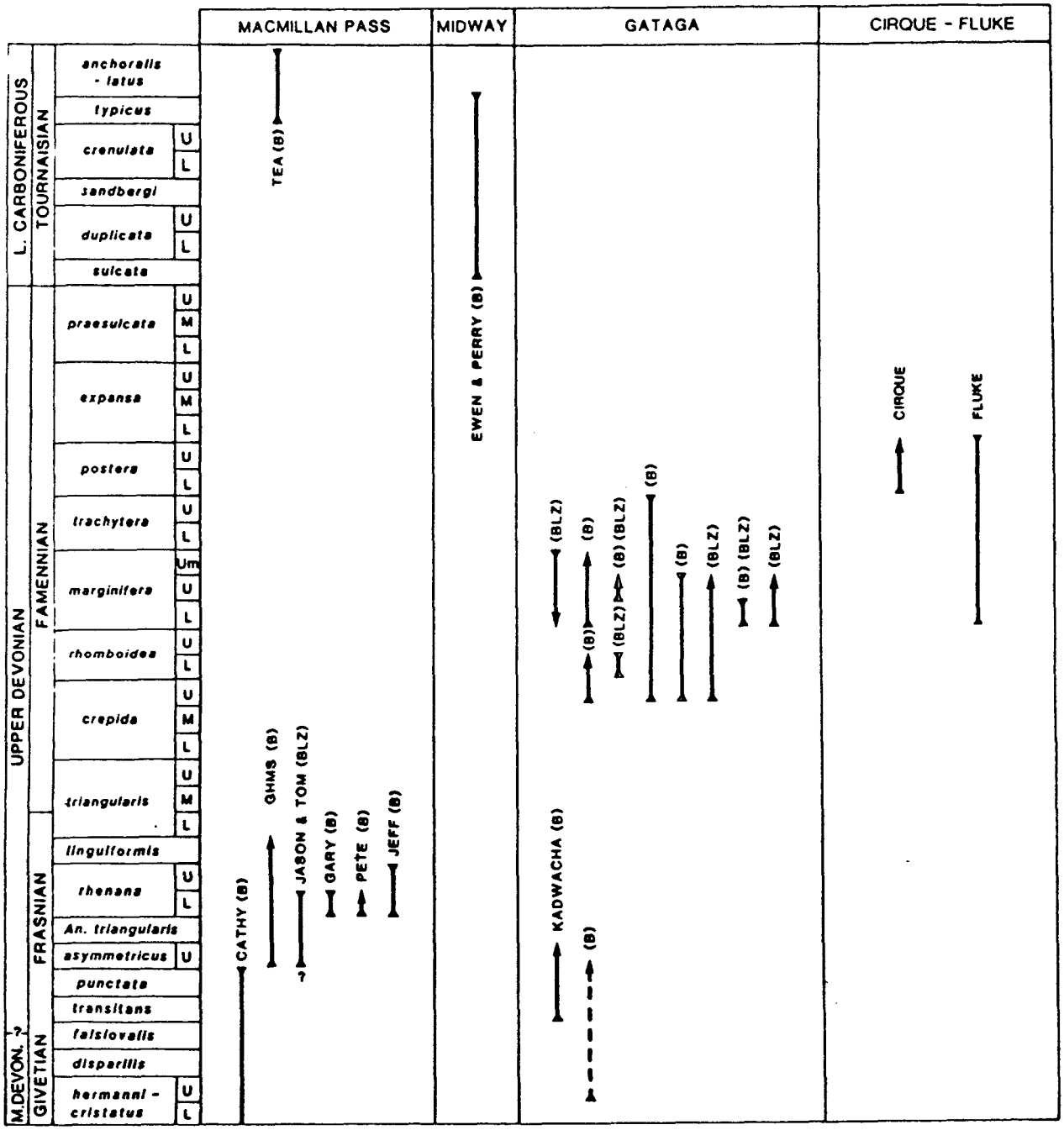
CONCLUSIONS

1. Assuming stratigraphic ordering as reported by Insley (1990), the CIRQUE mineralisation is no older than upper Famennian, Lower **postera** Zone. This represents the youngest Late Devonian stratiform mineralisation identified anywhere in the Earn Group (fig. 7). However, an alternative stratigraphic interpretation, would make the CIRQUE mineralisation equivalent to other Gataga - Driftpile mineralisation.

2. Assuming stratigraphic ordering as reported by Insley (1990), the FLUKE mineralisation is no older than middle Famennian, **marginifera** Zone and no younger than upper Famennian, **postera** Zone (fig. 7). This mineralisation is equivalent to the middle Famennian mineralisation at Gataga.

3. Conodont faunas provide a middle Famennian age for the porcellanite units and 'Pregnant' shale facies of the Gunsteel Formation at both FLUKE and CIRQUE. The former is more precisely dated as **marginifera** Zone.

4. An Ordovician fauna was recovered from an unidentified unit in drill hole 80-C-13 at CIRQUE. Early Silurian (Llandovery) conodont faunas were recovered from the 'Silurian' siltstone unit of the Road River Group at both CIRQUE and FLUKE. No conodont faunas were recovered from the Earn Group Akie Formation, Warneford Formation or Conundrum Siltstone.



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CONODONT BIOSTRATIGRAPHY BARITE-SULPHIDE MINERALIZATION SELWYN & KECHIKA BASINS

Date: 90/06/22	Drawn by: H.D.S.
Drawing No. AK-AK-90-014	Figure No. 7

Conodont Fauna	FAMENNIAN																				
	triangularis			crepida			rhomboidea		marginifera			trachytera		postera		expansa			praesulcata		
	L	M	U	L	M	U	L	U	L	U	Um	L	U	L	U	L	M	U	L	M	U
Palmatolepis glabra distorta																					
Palmatolepis glabra lepta																					
Palmatolepis glabra pectinata																					
Palmatolepis gracilis gracilis																					
Palmatolepis m. marginifera																					
Palmatolepis minuta minuta																					
Palmatolepis perlobata postera																					
Palmatolepis p. schindewolfi																					
Palmatolepis q. inflexoidea																					
Palmatolepis rugosa ampla																					
Palmatolepis rugosa cf. ampla																					
Palmatolepis rugosa trachytera																					
Palmatolepis rugosa rugosa																					

Table I. Age ranges of important Famennian conodont species and subspecies at Cirque and Fluke. Based on Ziegler, 1962, 1971; Klapper & Ziegler, 1979; Ziegler & Sandberg, 1984; Sweet, 1988.

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FAMENNIAN CONODONT SPECIES AGE RANGES

Date: 90/06/22	Drawn by: H.D.S.
Drawing No. AK-AK-90-008	Table No. I

TABLE II
CIRQUE PROPERTY (57°31' N 124°50'W)
CONODONT SAMPLE LIST - SURFACE SAMPLES

CONODONT NO	FIELD LOCALITY	UTM COORDINATES		SAMPLE DESCRIPTION	STRATIGRAPHIC UNIT	AGE
		NORTH	EAST			
C1 (Top)	LC12	6,375,867	371,528	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C2	LC12	6,375,867	371,528	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C3	LC12	6,375,867	471,528	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C4	LC12	6,375,867	471,528	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C5 (Bottom)	LC12	6,375,867	471,528	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C6 (Top)	LC13	6,375,939	371,486	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	indeterminate
C7 (Bottom)	LC13	6,375,939	371,486	Limestone lens within baritic siliceous shale	Gunsteel - porcellanite	Famennian, postera
C8	LC14	6,375,890	371,728	Small limestone concretion in silty argillite and siltstone	Warneford	indeterminate
C9	LC15	6,375,840	371,016	Limestone in float associated with porcellanite	Gunsteel - porcellanite	indeterminate
C10	LC16	6,375,920	370,844	Calcareous siltstone from dolomitic siltstone unit	Silurian Siltstone	indeterminate
C11 (Top)	LC17	6,376,988	370,120	Limestone concretion from baritic siliceous shale	Gunsteel - pregnant shale	Famennian
C12	LC17	6,376,988	370,120	Limestone concretion from baritic siliceous shale	Gunsteel - pregnant shale	indeterminate
C13 (Bottom)	LC17	6,376,988	370,120	Limestone concretion from baritic siliceous shale	Gunsteel - pregnant shale	indeterminate
C14	LC18	6,377,041	370,107	Limestone concretion from baritic siliceous shale	Gunsteel - pregnant shale	indeterminate
C15	LC19	6,376,454	370,143	Limestone bed in dolomitic siltstone/mudstone	Silurian Siltstone	indeterminate

TABLE II
CIRQUE PROPERTY (57°31' N 124°50'W)
CONODONT SAMPLE LIST - SURFACE SAMPLES

CONODONT NO	FIELD LOCALITY	UTM COORDINATES		SAMPLE DESCRIPTION	STRATIGRAPHIC UNIT	AGE
C16	LC20	6,376,283	370,194	Limestone bed in dolomitic siltstone/mudstone	Silurian Siltstone	Silurian
C17	LC22	6,375,665	370,404	Limestone bed near top of dolomitic siltstone	Silurian Siltstone	indeterminate
C22	LC10	6,375,609	371,292	Limestone concretion from porcellanite	Gunsteel - porcellanite	Famennian

Table III.
CIRQUE PROPERTY (57°31' N 124°50' W)
CONODONT SAMPLE LIST - DRILL CORE SAMPLES

CONODONT NO	DRILL HOLE	DEPTH	SAMPLE DESCRIPTION	STRATIGRAPHIC UNIT	AGE
C30	EG79C-24	461.6 m	Nodular limestone	Gunsteel - porcellanite (footwall)	Famennian
C31	EG79C-14	329.5 m	Nodular limestone	Gunsteel - porcellanite (footwall)	indeterminate
C32	EG79C-14	333.4 m	Nodular limestone	Gunsteel - porcellanite (footwall)	indeterminate
C33	EG80C-13	214.4 m	Nodular limestone	Ordovician shale	indeterminate
C34	EG80C-13	215.0 m	Nodular limestone	Ordovician shale	Ordovician

Table IV.
FLUKE PROPERTY (57°24' N 124°54' W)
CONODONT SAMPLE LIST - SURFACE SAMPLES

CONODONT NO	FIELD LOCALITY	UTM COORDINATES		SAMPLE DESCRIPTION	STRATIGRAPHIC UNIT	AGE
		NORTH	EAST			
F1	LF29					Famennian, marg.
F2	LF33	6,363,732	385,200	Limestone concretion from top of dolomitic siltstone unit	Silurian Siltstone	Early-Mid Devonian
F3	LF33	6,363,717	385,222	Limestone concretion from top of dolomitic siltstone unit	Silurian Siltstone	indeterminate
F4	LF69					Famennian, postera
F5	LF69					Famennian, postera
F6	LF75					Famennian, marg.
F7	LF79	6,363,058	385,574	Limestone from middle of Silurian limestone unit	Silurian Limestone	indeterminate
F8	LF81	6,362,763	386,130	Crinkle laminated grey/tan limestone near top of dolomitic siltstone unit	Silurian Siltstone	indeterminate
F9	LF107	6,362,662	386,905	Small limestone concretions in Pregnant Shale	Gunsteel - pregnant shale	indeterminate
F10	LF111	6,362,743	387,305	Limestone concretion in medium bedded siltstone/sandstone sequence	Conundrum Siltstone - DCS	indeterminate
F11	LF154	6,363,884	385,534	1 metre limestone concretion in thin bedded porcellanite	Porcellanite - DMWP	Famennian, marg.
F12	LF155	6,363,910	385,531	1 metre limestone concretion in thin bedded porcellanite	Porcellanite - DMWP	Famennian, marg.
F13	LF156	6,363,899	385,555	Large limestone concretion in thin bedded porcellanite	Porcellanite - DMWP	Famennian, marg.
F14	LF176	6,365,534	385,222	Bioclastic limestone	Kwadacha Reef - DKR	Givetian
F15	LF178	6,365,458	385,167	Calcareous siltstone below Kwadacha limestone	Possibly Silurian Siltstone	indeterminate
F16	LF182			Large limestone concretions in porcellanite unit	Porcellanite - DGC	Famennian, marg.
F17	LF189			Large limestone concretions in porcellanite unit	Porcellanite - DGC	Famennian, marg.

Table V.
FLUKE PROPERTY (547°24' N 124°54' W)
CONODONT SAMPLE LIST - DRILL CORE SAMPLES

CONODONT NO	DRILL HOLE	DEPTH	SAMPLE DESCRIPTION	STRATIGRAPHIC UNIT	AGE
F18	EG80F-01	23.0 m	Calcareous siltstone in siliceous shale	Gunsteel - pregnant shale	indeterminate
F19	EG80F-01	46.8 m	Calcareous siltstone in siliceous shale	Gunsteel - pregnant shale	indeterminate
F20	EG80F-01	72.0 m	Calcareous siltstone in siliceous shale	Gunsteel - pregnant shale	indeterminate
F21	EG80F-01	168.7 m	Dark grey, soft shale with intraformational breccias	Warneford - intraformational breccia DMWBX	indeterminate
F22	EG80F-01	184.6 m	Massive porcellanite interbedded with pyritic siltstone	Porcellanite - DMWP	indeterminate
F23	EG80F-01	273.1 m	Dark grey shale with pyritic siltstone to sandstone interbeds	Warneford - DMWB	indeterminate
F24	EG80F-01	382.9 m	Siliceous shale with 1 - 2 cm framboidal pyrite interbeds	Gunsteel - pregnant shale	indeterminate
F25	EG80F-03	195.8 m	Nodular limestone 83 cm below barite mineralisation	Gunsteel - pregnant shale	Famennian
F26	EG80F-02	342.8 m	Limestone concretions in dark grey shale chip breccia	Warneford -DMWBX	indeterminate
F27	EG80F-03	160.2 m	Nodular limestone in barite-pyrite mineralisation	Gunsteel - pregnant shale	Famennian

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PLATE 1

Figures 1, 5: Astropentagnathus cf. A. irregularis Mostler
1: Pa element, X120, GSC Loc. No. C-176693, Cirque Property.
5: Pb element, X60, GSC Loc. No. C-176693, Cirque Property.

Figure 2: Astropentagnathus? sp., X60, GSC Loc. No. C-176693, Cirque Property.

Figure 3, 7, 8: Drepanoistodus sp.
3: reclined coniform element, X60, GSC Loc. No. C-176688, Cirque Property.
7: Geniculate coniform element, X60, GSC Loc. No. C-176700, Cirque Property.
8: recurved coniform element, X60, GSC Loc. No. C-176700, Cirque Property.

Figure 4: Distomodus sp., dolobrate M element, X60, GSC Loc. No. C-176693, Cirque Property.

Figure 6: Panderodus sp.; X60, GSC Loc. No. C-176693, Cirque Property, .

Figure 9: Pterospathodus celloni (Walliser), X60, GSC Loc. No. C-176693, Cirque Property.

Figure 10: Polygnathus glabra subsp., X120, GSC Loc. No. C-176688, Cirque Property.

Figures 11-12, 14-15, 17: Polygnathus? ramiform complex; X60, GSC Loc. No. C-176684, Cirque Property.
11: Sc element.
12: M element.
14: Pb element.
15: Sa element.
17: Sb element.

Figure 13: Oulodus? fluegli (Walliser), X60, GSC Loc. No. C-176693, Cirque Property.

Figure 16: Mehlina sp.; X60, GSC Loc. No. C-176654, Fluke Property.

Figures 18-19: Mazuelloids, X120, GSC Loc. No. C-176693, Cirque Property.

Figure 20: Radiolarian, X60, GSC Loc. No. C-176688, Cirque Property.

Figure 21: Sponge spicule, X60, GSC Loc. No. C-176680, Cirque Property.


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PLATE 2

Figures 1-4: **Palmatolepis marginifera marginifera** Helms
1: X60, GSC Loc. No. C-176661, Fluke Property.
2: X60, GSC Loc. No. C-176656, Fluke Property.
3: X60, GSC Loc. No. C-176651, Fluke Property.
4: X60, GSC Loc. No. C-176656, Fluke Property.

Figure 5: **Icriodus steinachensis** Al-Rawi; X60, GSC Loc. No. C-176652, Fluke Property.

Figure 6: **Palmatolepis perlobata schindewolfi** Muller; X60, GSC Loc. No. C-176651, Fluke Property.

Figures 7, 9: **Palmatolepis glabra distorta** Branson & Mehl
7: 60x, GSC Loc. No. C-176662, Fluke Property.
9: 60x, GSC Loc. No. C-176661, Fluke Property.

Figure 8, 10: **Palmatolepis glabra pectinata** Ziegler
8: X60, GSC Loc. No. C-176651, Fluke Property.
10: X60, GSC Loc. No. C-176662, Fluke Property.

Figure 11: **Palmatolepis glabra lepta** Ziegler & Huddle; X60, GSC Loc. No. C-176656, Fluke Property.

Figure 12: **Apathognathus varians** Branson & Mehl; X60, GSC Loc. No. C-176662, Fluke Property.

Figure 13: **Palmatolepis gracilis gracilis** Branson & Mehl; X60, GSC Loc. No. C-176654, Fluke Property.

Figure 14: **Palmatolepis minuta minuta** Branson & Mehl; X60, GSC Loc. No. C-176662, Fluke Property.

Figure 15: **Polygnathus** sp.; X60, GSC Loc. No. C-176677, Fluke Property.

Figure 16: **'Icriodus'** sp.; X60, GSC Loc. No. C-176654, Fluke Property.

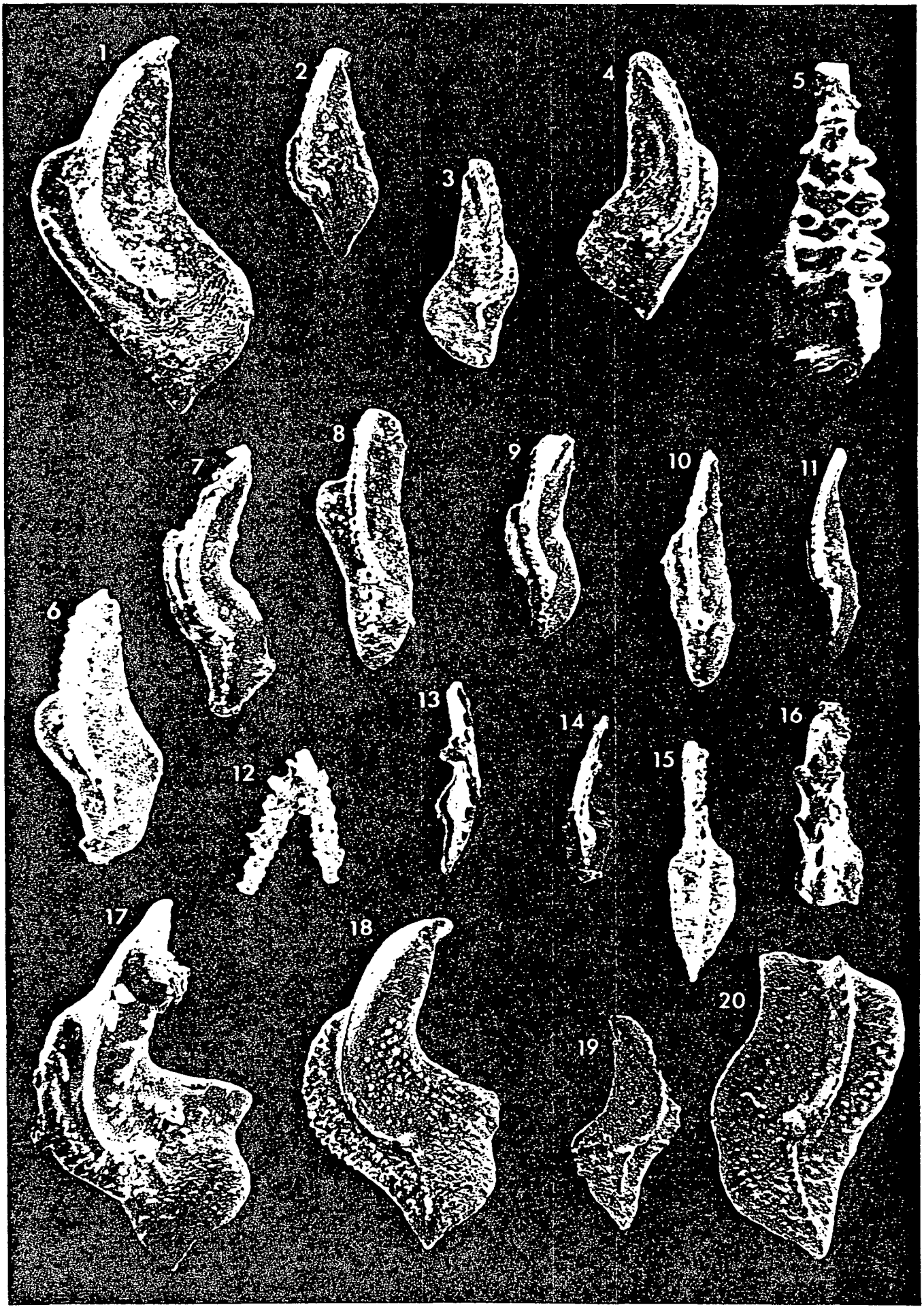
Figure 17: **Palmatolepis rugosa ampla** Muller **Palmatolepis rugosa rugosa** Branson & Mehl; X60, GSC Loc. No. C-176654, Fluke Property.

Figure 18: **Palmatolepis rugosa ampla** Muller: X60, GSC Loc. No. C-176684, Cirque Property.

Figure 19: **Palmatolepis rugosa** sp.; X60, GSC Loc. No. C-176655, Fluke Property.

Figure 20: **Palmatolepis perlobata postera** Muller: X60, GSC Loc. No. C-176655, Fluke Property.

PLATE 2



APPENDIX A

CIRQUE SAMPLE DESCRIPTIONS AND LOCATIONS

GSC location number: C-176678
field number: LC-12, C1
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 87.5 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation, Upper Member of Pregnant Shale Formation (DG_{PR})
stratigraphic description: Limestone at base of thin bedded, ribbon banded, rusty weathering cherty argillite. Above baritic shale sequence.
lithology: dark grey, coarse crystalline limestone
weight of sample processed: 2.704 kg.
weight of undissolved sample:
fossils: sponge spicules (1+)
conodonts: ramiform elements (2)
colour alteration index: 5
period or epoch: indeterminate
remarks: large baritic residue.

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GSC location number: C-176679
field number: LC-12, C2
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 84.75 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation, Upper Member of Pregnant Shale Formation (DG_{PR})
stratigraphic description: Limestone within a baritic shale sequence.
lithology: dark grey, coarse crystalline limestone
weight of sample processed: 4.050 kg.
weight of undissolved sample: 1.852 kg.
fossils: radiolarian, sponge spicules
conodonts: ramiform elements (1)
colour alteration index: 5
period or epoch: indeterminate
remarks: large baritic residue. 1/3 of sample remains unpicked.

GSC location number: C-176680
field number: LC-12, C3
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 84.25 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation, Upper Member of Pregnant Shale Formation (DG_{PR})
stratigraphic description: Limestone within a baritic shale sequence.
lithology: dark grey, coarse crystalline limestone
weight of sample processed: 2.966 kg.
weight of undissolved sample: 1.417 kg.
fossils: sponge spicules, radiolarians
conodonts: ramiform elements (3)
colour alteration index: 5
period or epoch: indeterminate
remarks: large baritic residue. 2/5 of sample remains unpicked.

****

GSC location number: C-176681
field number: LC-12, C4
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 81.75 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation, Upper Member of Pregnant Shale Formation (DG_{PR})
stratigraphic description: Limestone within a baritic shale sequence.
lithology: dark grey, coarse crystalline limestone
weight of sample processed: 2.514 kg.
weight of undissolved sample: 1.340 kg.
fossils: sponge spicules, radiolarians
conodonts: none
period or epoch: indeterminate
remarks: large baritic residue. 1/3 of sample remains unpicked.

GSC location number: C-176682
field number: LC-12, C5
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 81 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation, Upper Member of Pregnant Shale Formation (DG_{PR})
stratigraphic description: Limestone near base of a baritic shale sequence.
lithology: black, coarse crystalline, thin bedded limestone
weight of sample processed: 2.864 kg.
weight of undissolved sample: 1.153 kg.
fossils: sponge spicules
conodonts: ramiform (1)
colour alteration index: 5
period or epoch: indeterminate
remarks: large baritic residue. 1/2 of sample remains unpicked.

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GSC location number: C-176683
field number: LC-13, C6
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the 7.5 m level of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation.
stratigraphic description: Boudinaged blocks of limestone near base of a ribbon banded chert with siliceous shale partings and occasional beds up to 15 cm sequence. Limestone collected from 1 m above baritic sequence of the Lower Member of the Pregnant Shale facies (DG_{PR}).
lithology: dark grey, coarse crystalline, laminated limestone
weight of sample processed: 3.011 kg.
weight of undissolved sample: 1.106 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: 3/8 of sample remains unpicked.

GSC location number: C-176684
field number: LC-13, C7
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, southeastern end, collected from the base of the logged section through Upper and Lower Pregnant Shale facies.
lithologic unit: Gunsteel Formation.
stratigraphic description: Limestone at base of a ribbon banded chert with siliceous shale partings and occasional beds up to 15 cm sequence. Sampled from limestone 5 metres below Lower Member of Pregnant Shale Facies.
lithology: dark grey, medium grained limestone
weight of sample processed: 2.031 kg.
weight of undissolved sample: 0.711 kg.
fossils: none
conodonts: **Palmatolepis perlobata schindewolfi** Muller (2)
Palmatolepis rugosa ampla Muller (1)
Polygnathus glabra subsp. indet. (1)
ramiform elements (Sa, Sb, Sc, M, Pb elements) (31)
colour alteration index: 4-5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: Lower **postera** through Middle **expansa**.
remarks: large baritic residue.

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GSC location number: C-176685
field number: LC-14, C8
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Warneford Formation.
stratigraphic description: small limestone concretion within silty argillite and siltstone unit.
lithology: medium grey, thinly laminated, fine grain limestone
weight of sample processed: 2.023 kg.
weight of undissolved sample: 1.201 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: large baritic residue.

GSC location number: C-176686
field number: LC-15, C9
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Gunsteel Formation, porcellanite unit.
stratigraphic description: limestone in float associated with porcellanite unit
lithology: dark grey, medium-fine crystalline limestone
weight of sample processed: 2.610 kg.
weight of undissolved sample: 0.761 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: 2/3 of sample remains unpicked.

****

GSC location number: C-176687
field number: LC-16, C10
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: 'Silurian' siltstone
stratigraphic description: calcareous siltstone from dolomitic siltstone unit.
lithology: medium grey, fine grain, thinly laminated calcareous siltstone.
weight of sample processed: 1.637 kg.
weight of undissolved sample: 1.416 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as Silurian age.

GSC location number: C-176688
field number: LC-17, C11
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Pregnant Shale Formation.
stratigraphic description: limestone concreton from upper Pregnant shale unit (top).
lithology: medium grey, fine grain, thinly laminated limestone
weight of sample processed: 2.299 kg.
weight of undissolved sample: 1.124 kg.
fossils: radiolarians, sponge spicules
conodonts: coniform element (1)
Polygnathus glabra subsp. indet. (1)
ramiform elements (7)
colour alteration index: 5
period or epoch: Late Devonian
age:
conodont zone:
remarks: 1/4 of sample remains unpicked

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GSC location number: C-176689
field number: LC-17, C12
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Pregnant Shale Formation.
stratigraphic description: limestone concreton from upper Pregnant shale unit.
lithology: dark grey, medium-coarse crystalline limestone
weight of sample processed: 0.421 kg.
weight of undissolved sample: 0.029 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: 3/8 of sample remains unpicked

GSC location number: C-176690
field number: LC-17, C13
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Pregnant Shale Formation.
stratigraphic description: limestone concreton from upper Pregnant shale unit (bottom).
lithology: dark grey, coarse crystalline limestone with sulphide blebs.
weight of sample processed: 2.072 kg.
weight of undissolved sample: 0.468 kg.
fossils: radiolarians
conodonts: ramiform (5)
colour alteration index: 5
period or epoch: indeterminate
remarks:3/8 of sample remains unpicked

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GSC location number: C-176691
field number: LC-18, C14
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Pregnant Shale Formation.
stratigraphic description: limestone concreton from lower Pregnant shale unit.
lithology: dark grey, thinly laminated, fine grain limestone
weight of sample processed: 1.011 kg.
weight of undissolved sample: 0.753 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176692
field number: LC-19, C15
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: 'Silurian' siltstone
stratigraphic description: limestone bed within dolomiitic siltstone/mudstone.
lithology: thinly laminated, dark grey, fine grain limestone
weight of sample processed: 1.690 kg.
weight of undissolved sample: 0.239 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as Silurian age.

GSC location number: C-176693
field number: LC-20, C16
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: 'Silurian' siltstone
stratigraphic description: limestone bed within dolomiitic siltstone/mudstone.
lithology: dark grey, coarse crystalline, thinly bedded limestone
weight of sample processed: 2.189 kg.
weight of undissolved sample: 0.248 kg.
fossils: mazuelloids?, sponge spicules
conodonts: **Astropentagnathus** cf. **A. irregularis** Mostler (3)
Astropentagnathus sp. (3)
Distomodus sp. (6)
Pterospathodus celloni (Walliser) (1)
Oulodus? fluegli (Walliser) (2)
Panderodus sp. (1)
undiffereniated ramiform elements (15)
colour alteration index: 5
period or epoch: Early Silurian;
age: LLandovery.
remarks: Probable age specified by collector as Silurian age.

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GSC location number: C-176694
field number: LC-22, C17
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: 'Silurian' siltstone
stratigraphic description: limestone bed near top of dolomitic siltstone.
lithology: dark grey, fine grain, thinly bedded limestone
weight of sample processed: 2.054 kg.
weight of undissolved sample: 0.425 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as Silurian age.

GSC location number: C-176695
field number: LC-10, C22
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property
lithologic unit: Gunsteel Formation, porcellanite unit.
stratigraphic description: limestone concretion from porcellanite unit.
lithology: dark grey, medium crystalline limestone
weight of sample processed: 3.580 kg.
weight of undissolved sample: 0.691 kg.
fossils: sponge spicules
conodonts: **Bispathodus** sp. indet. (1)
Icriodus sp. indet. (1)
Palmatolepis sp. indet. (3)
ramiform elements (12)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian.
remarks: 3/8 of sample remains unpicked

****

GSC location number: C-176696
field number: DDH 79-C-24 C30
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, DDH 79-C-24, 461.6m depth
lithologic unit: Gunsteel Formation, porcellanite unit.
stratigraphic description: nodular limestone.
lithology: dark grey, medium grain, thinly laminated limestone
weight of sample processed: 0.940 kg.
weight of undissolved sample: 0.168 kg.
fossils: none
conodonts: **Palmatolepis** sp. indet. (1)
Icriodus sp. indet. (2)
Polygnathus sp. indet. (1)
ramiform elements (3)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian.
remarks: 1/2 of sample remains unpicked

GSC location number: C-176697
field number: DDH 79-C-14 C32
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, DDH 79-C-14, 333.35 m depth
lithologic unit: Gunsteel Formation, porcellanite unit.
stratigraphic description: nodular limestone
lithology: dark grey, coarse crystalline limestone
weight of sample processed: 0.404 kg.
weight of undissolved sample: 0.005 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176698
field number: DDH 79-C-14 C31
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, DDH 79-C-14, 329.5 m depth
lithologic unit: Gunsteel Formation, porcellanite unit.
stratigraphic description: nodular limestone
lithology: fine grain, dark grey, limestone with sulphide blebs
weight of sample processed: 0.158 kg.
weight of undissolved sample: 0.037 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176699
field number: DDH 80-C-13 C33
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, DDH 80-C-13, 214.4 m depth
lithologic unit: Ordovician shale unit.
stratigraphic description: nodular limestone
lithology: dark grey, fine crystalline limestone with sulphide blebs and laminae.
weight of sample processed: 0.769 kg.
weight of undissolved sample: 0.243 kg.
fossils: sponge spicules
conodonts: coniform element (1)
colour alteration index: 5
period or epoch: indeterminate

GSC location number: C-176700
field number: DDH 80-C-13 C34
map area: Ware, 94F/10
latitude and longitude: 57° 31', 124° 50'
geographic description: Cirque property, DDH 80-C-13, 215.0 m depth
lithologic unit: Ordovician shale unit.
stratigraphic description: nodular limestone
lithology: dark grey, fine crystalline limestone
weight of sample processed: 0.773 kg.
weight of undissolved sample: 0.108 kg
fossils: pyritized sponge spicules
conodonts: **Drepaniostodus** sp. (3)
colour alteration index:5
period or epoch: Ordovician
remarks: 1/3 of sample remains unpicked

APPENDIX B

FLUKE SAMPLE DESCRIPTIONS AND LOCATIONS

GSC location number: C-176651
field number: LF-29, F1
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: unknown
lithology: dark grey, fine grain, thinly laminated, limestone
weight of sample processed: 2.404 kg.
weight of undissolved sample: 0.987 kg.
fossils: none
conodonts: **Palmatolepis glabra lepta** Ziegler & Huddle (6)
Palmatolepis glabra pectinata Ziegler (3)
Palmatolepis marginifera marginifera Helms (1)
Palmatolepis perlobata schindewolfi Muller (2)
platform fragments (13)
ramiform elements (1)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: **marginifera.**

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GSC location number: C-176652
field number: LF-33, F2
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: 'Silurian' Siltstone
stratigraphic description: limestone concretion from top of Silurian dolomitic siltstone unit
lithology: medium grain, dark grey, thinly bedded limestone.
weight of sample processed: 1.870 kg.
weight of undissolved sample: 1.170 kg.
fossils: none
conodonts: **Icriodus steinachensis** Al-Rawi (7)
ramiform elements (2)
coniform element of **Icriodus** sp. indet. (1)
colour alteration index: 5
period or epoch: Early Devonian
age: Lochkovian.
remarks: Probable age specified by collector as Silurian age.

GSC location number: C-176653
field number: LF-33, F3
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: 'Silurian' Siltstone
stratigraphic description: limestone concretion from top of Silurian dolomitic siltstone unit
lithology: dark grey, fine grain, thinly laminated limestone.
weight of sample processed: 0.366 kg.
weight of undissolved sample: 0.162 kg.
fossils: none
conodonts: simple cones (2)
colour alteration index: 5
period or epoch: indeterminate
remarks: Probable age specified by collector as latest Silurian age.

****

GSC location number: C-176654
field number: LF-69, F4
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: unknown
lithology: dark grey, medium crystalline, thinly laminated limestone.
weight of sample processed: 1.047 kg.
weight of undissolved sample: 0.344 kg.
fossils: none
conodonts: **Palmatolepis rugosa ampla** Muller (1)
Palmatolepis rugosa trachytera Ziegler (1)
Palmatolepis rugosa subsp. indet. (2)
Palmatolepis gracilis gracilis Branson & Mehl (1)
Palmatolepis glabra cf. **glabra** subsp. indet. (4)
Bispathodus sp. indet. (4)
ramiform elements (12)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone:

GSC location number: C-176655
field number: LF-69, F5
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic: unknown
lithology: dark grey, fine-medium crystalline, thinly laminated limestone.
weight of sample processed: 0.530 kg.
weight of undissolved sample: 0.063 kg.
fossils: sponge spicules and radiolarians (1)
conodonts: **Palmatolepis perlobata postera** Ziegler (4)
Palmatolepis rugosa subsp. indet. (4)
ramiform elements (9)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: **postera.**

****

GSC location number: C-176656
field number: LF-75, F6
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: unknown
lithology: dark grey, fine grain, thinly bedded limestone.
weight of sample processed: 1.405 kg.
weight of undissolved sample: 0.463 kg.
fossils: none
conodonts: **Palmatolepis marginifera marginifera** Helms (7)
Palmatolepis glabra lepta Ziegler & Huddle (4)
Palmatolepis glabra distorta Branson & Mehl (3)
Palmatolepis glabra pectinata Ziegler (1)
Palmatolepis cf. **P. qaudrantinodosa inflexoidea** (1)
ramiform elements (3)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: **marginifera.**

GSC location number: C-176657
field number: LF-79, F7
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: 'Silurian' limestone
stratigraphic description: limestone from middle of Silurian limestone unit
lithology: dark grey, fine grained limestone
weight of sample processed: 1.579 kg.
weight of undissolved sample: 0.311 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as Silurian age.

****

GSC location number: C-176658
field number: LF-81, F8
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: 'Silurian' limestone
stratigraphic description: crinkle laminated grey/tan limestone near top of Silurian dolomitic siltstone unit
lithology: medium grey, fine grain, platy thinly laminated limestone.
weight of sample processed: 1.577 kg.
weight of undissolved sample: 0.219 kg.
fossils: sponge spicules
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as Silurian age.

****

GSC location number: C-176659
field number: LF-107, F9
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Pregnant Shale unit
stratigraphic description: small limestone concretions within pregnant shale unit.
lithology: dark grey, medium crystalline limestone
weight of sample processed: 1.224 kg.
weight of undissolved sample: 0.517 kg.
fossils: pyritized radiolarians
conodonts: none
period or epoch: indeterminate

GSC location number: C-176660
field number: LF-111, F10
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Conundrum Siltstone
stratigraphic description: limestone concretion within medium bedded siltstone and sandstone sequence
lithology: dark grey, fine grain, poorly calcareous argillite
weight of sample processed: 1.209 kg.
weight of undissolved sample: 1.077 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176661
field number: LF-154, F11
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Gunsteel Formation, porcellanite unit
stratigraphic description: 1 metre limestone concretion in thin bedded black chert and argillite
lithology: medium grey, fine grain, nodular limestone
weight of sample processed: 1.480 kg.
weight of undissolved sample: 0.249 kg.
fossils: sponge spicules
conodonts: **Palmatolepis glabra lepta** Ziegler & Huddle (8)
Palmatolepis marginifera marginifera Helms (16)
Palmatolepis glabra distorta Branson & Mehl (5)
Palmatolepis glabra pectinata Ziegler (7)
Palmatolepis sp. indet. (2)
Polygnathus sp. indet. (4)
ramiform elements (29)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: marginifera.

GSC location number: C-176662
field number: LF-155, F12
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Gunsteel Formation, porcellanite unit
stratigraphic description: 1 metre limestone concretion in thin bedded black chert and argillite
lithology: dark grey, fine grain limestone
weight of sample processed: 1.564 kg.
weight of undissolved sample: 0.317 kg.
fossils: radiolarians, very abundant sponge spicules
conodonts: **Palmatolepis glabra lepta** Ziegler & Huddle (13)
Palmatolepis glabra pectinata Ziegler (11)
Palmatolepis marginifera marginifera Helms (9)
Palmatolepis glabra distorta Branson & Mehl (5)
Palmatolepis minuta minuta Branson & Mehl (1)
simple cone elements (4)
ramiform elements (21)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: **marginifera.**

****

GSC location number: C-176663
field number: LF-156, F13
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Gunsteel Formation, porcellanite unit
stratigraphic description: large limestone concretion in thin bedded black chert and argillite
lithology: dark grey, fine grain limestone
weight of sample processed: 1.638 kg.
weight of undissolved sample: 0.382 kg.
fossils: none
conodonts: **Palmatolepis glabra lepta** Ziegler & Huddle (8)
Palmatolepis glabra pectinata Ziegler (7)
Palmatolepis marginifera cf. **P. m. marginifera** (2)
Palmatolepis perlobata schindewolfi Muller (2)
Polygnathus sp. indet. (1)
Bispathodus sp. indet. (1)
platform fragments (3)
ramiform elements (20)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian;
conodont zone: **marginifera.**

GSC location number: C-176664
field number: LF-176, F14
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Kwadacha limestone
stratigraphic description: bioclastic limestone from Kwadacha reef
lithology: light grey, medium-fine bioclastic limestone
weight of sample processed: 1.450 kg.
weight of undissolved sample: 0.142 kg.
fossils: conodont pearls (20+)
conodonts: **Polygnathus** cf. **P. linguiformis** subsp. indet. (2)
Polygnathus xylus subsp. indet. (1)
Polygnathus sp. indet. (1)
ramiform elements (32)
colour alteration index: 5
period or epoch: Middle Devonian;
age: Early Givetian.

****

GSC location number: C-176665
field number: LF-178, F15
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Silurian siltstone
stratigraphic description: calcareous siltstone below Kwadacha liimestone
lithology: medium grey, fine grain, thinly laminated, pyritic calcareous siltstone.
weight of sample processed: 0.811 kg.
weight of undissolved sample: 0.758 kg.
fossils: none
conodonts: none
period or epoch: indeterminate
remarks: Probable age specified by collector as latest Silurian age.

GSC location number: C-176666
field number: LF-182, F16
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Gunsteel Formation, porcellanite unit
stratigraphic description: large limestone concretions
lithology: dark grey, medium crystalline, platy limestone
weight of sample processed: 0.746 kg.
weight of undissolved sample: 0.090 kg.
fossils: radiolarians
conodonts: **Palmatolepis perlobata schindewolfi** Muller (5)
ramiform elements (1)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian.

****

GSC location number: C-176667
field number: LF-189, F17
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property.
lithologic unit: Gunsteel Formation, porcellanite unit
stratigraphic description: large limestone concretions
lithology: dark grey, medium-fine crystalline, nodular limestone
weight of sample processed: 1.525 kg.
weight of undissolved sample: 0.343 kg.
fossils: sponge spicules
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176668
field number: DDH 80-F1-F18
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH 80-F-01, 23 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
stratigraphic description: porcellanite within active 'Pregnant' shale facies
lithology: black, fine grained, thinly laminated limestone
weight of sample processed: 0.643 kg.
weight of undissolved sample: 0.300 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

GSC location number: C-176669
field number: DDH 80-F1-F19
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH 80-F-01, 46.8 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
lithology: dark grey, fine grain, pyritic limestone
weight of sample processed: 0.471 kg.
weight of undissolved sample: 0.300 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176670
field number: DDH 80-F1-F20
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH 80-F-01, 72.0 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
lithology: black, fine grain, graphitic limestone
weight of sample processed: 0.422 kg.
weight of undissolved sample: 0.164 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176671
field number: DDH 80-F1-F21
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH-80-F-01, 168.7 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
lithology: black, pyritic, calcareous argillite
weight of sample processed: 0.568 kg.
weight of undissolved sample: 0.524 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

GSC location number: C-176672
field number: DDH 80-F1-F22
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH-80-F-01, 184.55 m depth.
lithologic unit: Warneford Formation
lithology: black, pyritic, calcareous argillite.
weight of sample processed: 0.507 kg.
weight of undissolved sample: 0.460 kg
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176673
field number: DDH 80-F1-F23
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH-80-F-01, 273.1 m depth.
lithologic unit: Warneford Formation.
lithology: black, fine grain, calcareous argillite.
weight of sample processed: 1.067 kg.
weight of undissolved sample: 0.991 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

****

GSC location number: C-176674
field number: DDH 80-F1-F24
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH-80-F-01, 382.9 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
lithology: black, laminated, poorly calcareous argillite.
weight of sample processed: 0.699 kg.
weight of undissolved sample: 0.657 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

GSC location number: C-176676
field number: DDH 80-F3-F25
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH 80-F-03, 195.75 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
stratigraphic description: nodular limestone in barite-pyrite mineralisation
lithology: dark grey, medium crystalline, pyritic limestone
weight of sample processed: 0.536 kg.
weight of undissolved sample: 0.170 kg.
fossils: radiolarians, sponge spicules
conodonts: **Palmatolepis glabra lepta** Ziegler & Huddle (1)
Palmatolepis sp. indet. (3)
ramiform elements (5)
colour alteration index: 5
period or epoch: Late Devonian;
age: Famennian.
remarks: 1/4 of sample remains unpicked

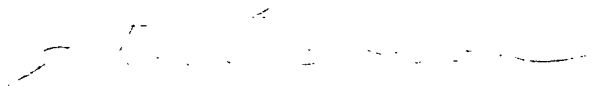
****

GSC location number: C-176675
field number: DDH 81-F2-F26
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH-81-F-02, 342.8 m depth.
lithologic unit: Warneford Formation.
lithology: black, fine grain limestone
weight of sample processed: 0.676 kg.
weight of undissolved sample: 0.494 kg.
fossils: none
conodonts: none
period or epoch: indeterminate

GSC location number: C-176677
field number: DDH 80-F3-F27
map area: Ware, 94F/7
latitude and longitude: 57°24'W, 124°54'N
geographic description: Fluke property, DDH- 80-F-03, 160.2 m depth.
lithologic unit: Gunsteel Formation,'Pregnant' shale facies.
stratigraphic description: nodular limestone 83cm below barite mineralisation
lithology: black, fine grain limestone with sulphide blebs
weight of sample processed: 0.732 kg.
weight of undissolved sample: 0.492 kg.
fossils: none
conodonts: **Palmatolepis** sp. indet. (1)
Polygnathus sp. indet. (1)
colour alteration index: 5-6
period or epoch: Late Devonian;
age: Famennian

STATEMENT OF QUALIFICATIONS

I, Steven E.B. Irwin, of 791 Underhill Drive, Delta, B.C. do hereby certify that I hold both a Master of Science degree (1990) and a Bachelor of Science degree (1985) in Geological Sciences from the University of British Columbia. This report was compiled for Curragh Resources Inc. between January 1, 1990 and March 31, 1990. The report was submitted to Curragh Resources Inc. March 31, 1990.



Steven E.B. Irwin, M.Sc., B.Sc.
Geologist

March 31, 1990

Fluke Claims - Statement of Costs

Personnel

Geologist , Martin Insley; Aug 22-30/89; 9 days at $250/day	$2,250.00
Field assistant, Chuck Hubert; Aug 22-30/89; 9 days at $120/day + benefits($112.72)	$1,192.72
Report writing, Martin Insley; Jan/90; 4 days at $250/day (50%)	$500.00
Drafting, Holly Stirling; June 1,11,15,18,19/90; 33 hours at $17.50/hour	$577.50
Report Compilation, Lee Pigage; Mar 8,20, Apr 3, June 15,18,19,20; 3 days at $250/day	$750.00
Subtotal	$5,270.22

Travel

Whitehorse to Prince George return; Martin Insley, Chuck Hubert; Aug 12/89 (50%)	$818.00
Prince George to Finbow; Martin Insley, Chuck Hubert; Aug 13/89 (50%)	$676.00
Mackenzie to Finbow; groceries/gear; Aug 22/89 (100%)	$322.00
Ingenika to Prince George; Martin Insley; Sep 1/89 (50%)	$296.50
Hotel in Prince George; Aug 12/89	$44.28
Groceries for Fluke camp; Aug 13/89	$275.95
Subtotal	$2,432.73

Helicopter

Finbow to Cirque camp; M. Insley, C. Hubert & gear; Aug 13/89 (50%)	$590.45
Cirque camp to Fluke claims; M. Insley, C. Hubert & gear; Aug 22/89	$843.50
Fluke claims to Cirque camp; M. Insley, C. Hubert & gear; Aug 30/89	$1,687.00
Subtotal	$3,120.95

Purchase of camp gear for Fluke camp

Dome tent & 2 tarps	$227.94
2 Foamies	$99.98
Propane lantern & fuel	$80.92
Propane campstove	$69.99
Propane heater, regulator	$101.50
Propane tank	$36.98
Propane adaptor	$16.46
Flashlight	$19.98
Insect repellant	$13.96
Shovel, 2 pails	$36.09
Hammer, screwdriver, pliers	$54.96
Dishes, pots & utensils	$247.11
SBX 11A radio (prorated to 1 month rental)	$348.36
Shotgun & accessories	$563.96
Subtotal	$1,918.19

Conodont analysis/report; Steve Irwin; Jan/90 (50%)	$3,000.00
Total	$15,742.09

Note: (50%) following description indicates only 50% of total cost is reported for application to Fluke claims; report covers Cirque & Fluke; cost listed are Fluke portion only

LEGEND

EARN GROUP (DEVONIAN - MISSISSIPPIAN)

WARNEFORD FORMATION

- DMwr — soft grey shale with sandstone interbeds
- DMwbx — dark grey shale with chert and quartz sand to pebble conglomerate lenses
- DMwp — ribbon bedded, black chert with limestone concretions

CONUNDRUM SILTSTONE

- Dcs — light grey, speckled, soft, siltstone

AKIE FORMATION

- DAp — grey, faintly laminated, soft, phyllitic shale
  - DAph - hangingwall to mineralization
  - DApf - footwall to mineralization
- DAss — dark brown-grey, thick bedded, silty shale
- DAsl — thinly laminated, silty shale

GUNSTEEL FORMATION

- DGpr — black, siliceous shale - immediate host to mineralized horizons
- DGc — ribbon bedded, black chert
  - DGch - hangingwall to mineralization
  - DGcf - footwall to mineralization
- DGt — dark grey, siliceous shale with numerous siltstone laminae
  - DGth - hangingwall to mineralization
  - DGtf - footwall to mineralization
- DGlb — black, siliceous shale with interbands of finely laminated, framboidal pyrite
- DBbs — barite with lesser pyrite

KWADACHA REEF (DEVONIAN)

- Dkr — grey, thick bedded, fossiliferous limestone

ROAD RIVER GROUP (ORDOVICIAN - SILURIAN)

SILURIAN SILTSTONE

- Sss — tan-weathering, grey, slightly dolomitic siltstone
- Ssh — dark grey, shaly, laminated siltstone

SILURIAN CHERT

- Src — streaky white-striped, ribbon bedded porcellanite

SILURIAN LIMESTONE

- Srl — grey, rhythmic limestone with shale interbeds

ORDOVICIAN SHALE

- Org — black, variably calcareous, graptolitic shale
- Ors — tan-weathering, dark grey, finely laminated, silty shale to siltstone

KECHIKA GROUP (CAMBRIAN - ORDOVICIAN)

- COk — silvery grey, argillaceous, nodular limestone

GEOLOGICAL BRANCH
ASSESSMENT REPORT

20,129
PART 1
OF 2

FLUKE 7
FLUKE 8
FLUKE 2
FLUKE 6
FLUKE 10
FLUKE 9
FLUKE 4
FLUKE 3
FLUKE 5
FLUKE 1
FLUKE 11

LF178
LF176
LF133
LF151
LF155
LF156
LF19
LF81
LF107
LF111

NOTES: Compiled from aerial photography at an approximate scale of 1:20,000 flown in 1979.
Contours are at 20 metre intervals.

94-F/5 94-F/6 94-F/7

330000mE 400000mE
637
635
6360000mN

SCALE 1:250,000
5 4 3 2 1 0 5 10 15 20 25 30 kilometres

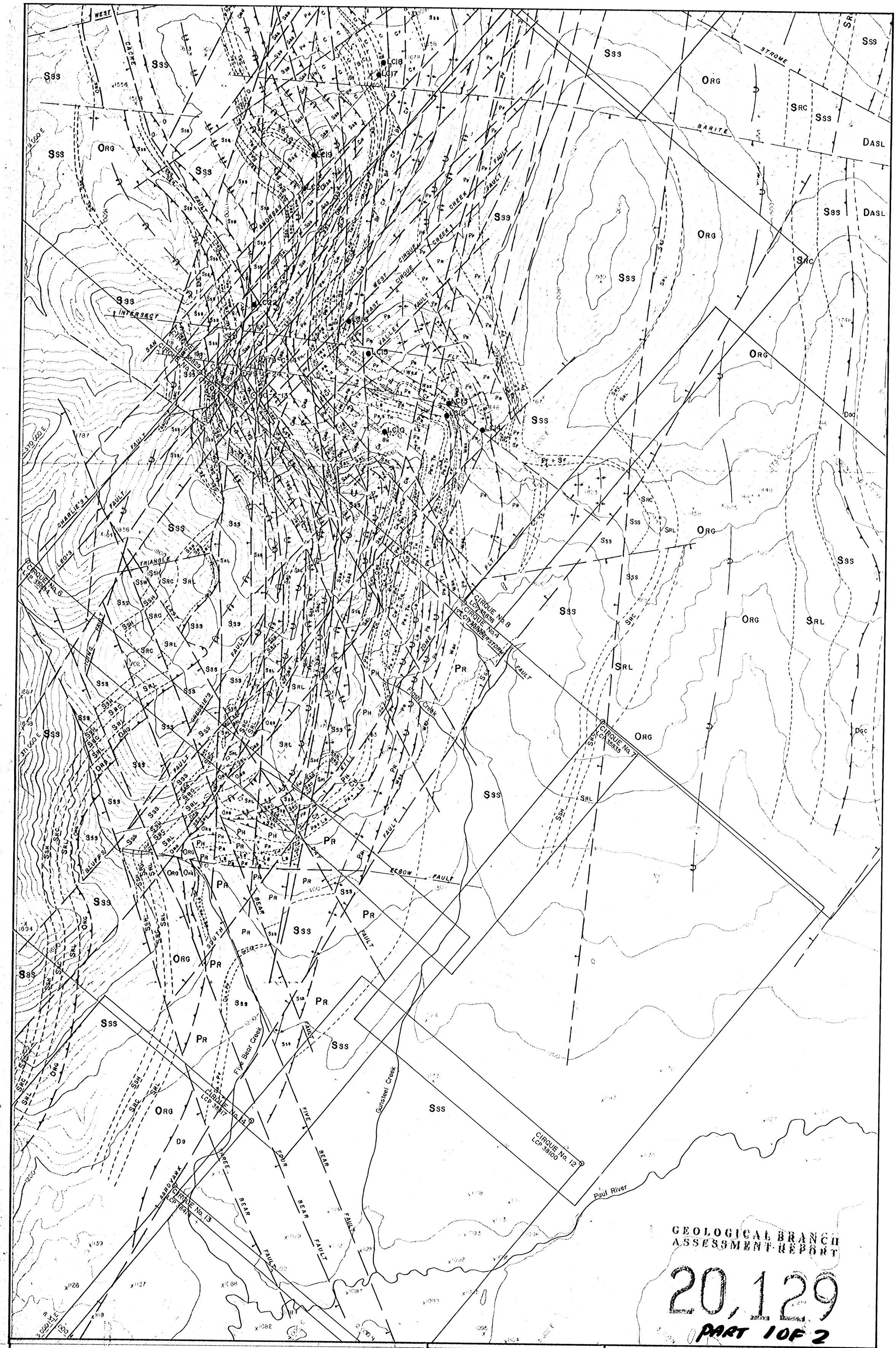
SCALE 1:10,000
100m 50m 0 100m 200m 300m 500m 1,000m

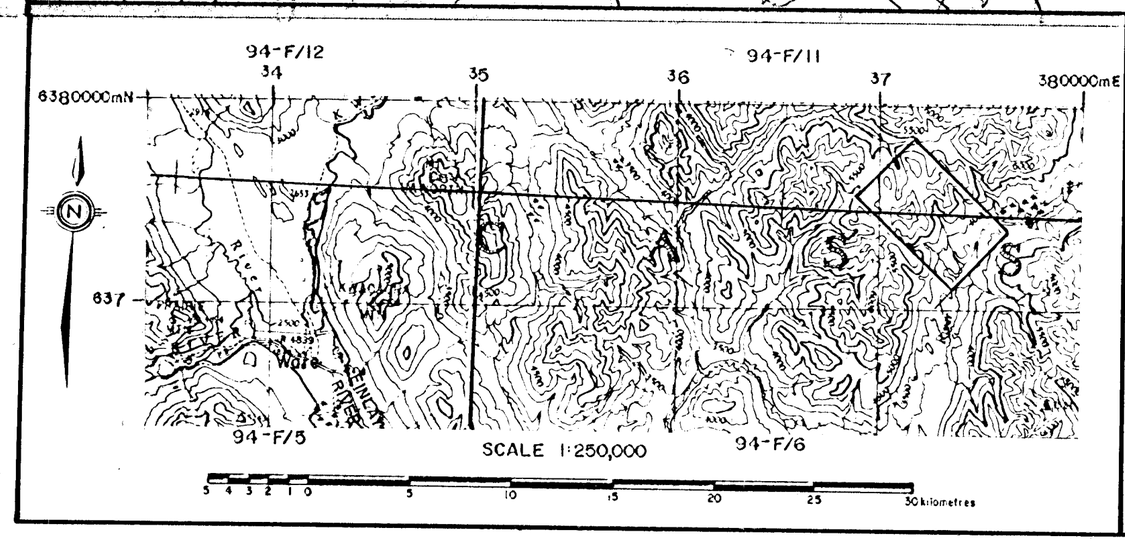
Curragh Resources Inc.

FLUKE CLAIMS

FLUKE CLAIMS GEOLOGY
CONODONT SAMPLE LOCATIONS

Design by: S.E.B.IRWIN	DRAWING NO. AK-FL-90-002	N.T.S. Sheet No. 94-F/7
Drawn by: H.D.S.		Report No. WH90-005
Date: 90/06/15		Figure No. 6
Revisions:		





NOTES: Compiled from aerial photography at an approximate scale of 1:20,000 flown in 1979.

Contours are at 20 metre intervals.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

20,129

PART 1 OF 2

Curragh Resources Inc.

CIRQUE CLAIMS

CIRQUE CLAIMS GEOLOGY
CONODONT SAMPLE LOCATIONS

SCALE 1:10,000

100m 50m 0 100m 200m 300m 500m 1,000m

Design by: S.E.B.IRWIN	DRAWING NO. AK-CQ-90-006	N.T.S. 94-F/6,11 Sheet No.
Drawn by: H.D.S.		Report No. WH90-005
Date: 90/06/14		Figure No. 4
Revisions:		