83-#766-11806

TEXT

Samim Canada Ltd.

SPILLIMACHEEN PROJECT

GEOLOGY, GEOCHEMISTRY, GEOPHYSICS AND DIAMOND DRILLING ON THE DEB CLAIMS

NTS 82 N/2, 3
82 K/14, 15

Golden Mining Division

Latitude 51°00'N
Longitude 117°00'W

by

T.J. Bottrill, S.D. Robinson and J.A. McCance

November, 1983

GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,806

part 1 of 3

Cony Peak in the Spillimacheen Range with Spillimacheen Glacier, taken from Sunday Ridge in the Silent Lake area.

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1. INTRODUCTION

The Spillimacheen project (DEB claims) covers a sequence of upper Precambrian marine sediments and minor volcanics within which a number of occurrences of stratabound lead-zinc-silver mineralization have been located as a result of an exploration program initiated in 1979 by First Nuclear Corporation, and continued since 1982 by Samim Canada Ltd. in joint venture with FNC.

In the 1979 to 1981 programs of regional geochemistry, geological mapping and rock-sampling a sequence of black-shale units were identified and mapped out over a strike length of 18 kms within the core of the Purcell Anticlinorium, at the base of the Windermere Group sediments. A number of stream-sediment anomalies were followed-up which led through prospecting and mapping to the discovery of a series of stratabound lead-zinc-silver occurrences. Mapping and reconnaissance soil-geochemistry in 1982 established the stratigraphic sequence and its continuity throughout the strike belt on the property, and led to the discovery of additional stratabound occurrences and geochemical anomalies.

The 1983 program, described in this report, explored in greater detail the Malachite Creek and Carbonate Mountain area with its concentration of occurrences of stratabound mineralization through geophysics, geology and diamond-drilling; further mapped the black-shale sequence to the northern limit of the property in the Silent Lake area; and geochemically sampled in both the Malachite Creek and Silent Lake areas.

As a result of this program the presence of stratabound mineralization was confirmed in diamond drilling, and a new high grade showing was located at Malachite Creek. Significant induced-polarization anomalies were located at Malachite Creek and Carbonate Mountain; drill-testing of one near-surface strong anomaly intersected massive, high grade mineralization. Significant soil geochemical anomalies were located at both Malachite Creek and Silent Lake which are at present unexplained.

A further program for 1984 is recommended to consist of further geophysics, follow-up soil geochemistry, geological mapping and diamond-drilling.

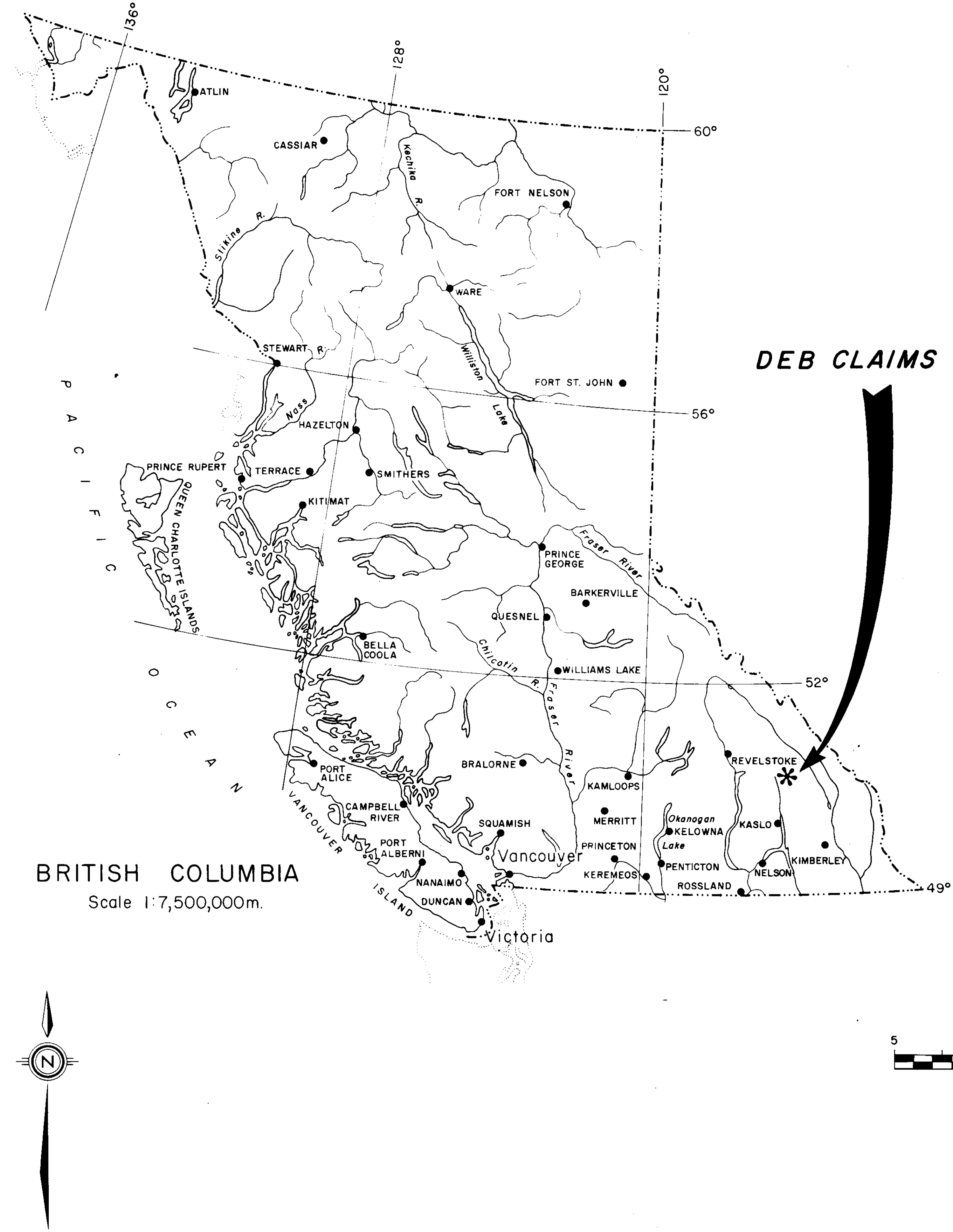
2. LOCATION, ACCESS AND TOPOGRAPHY

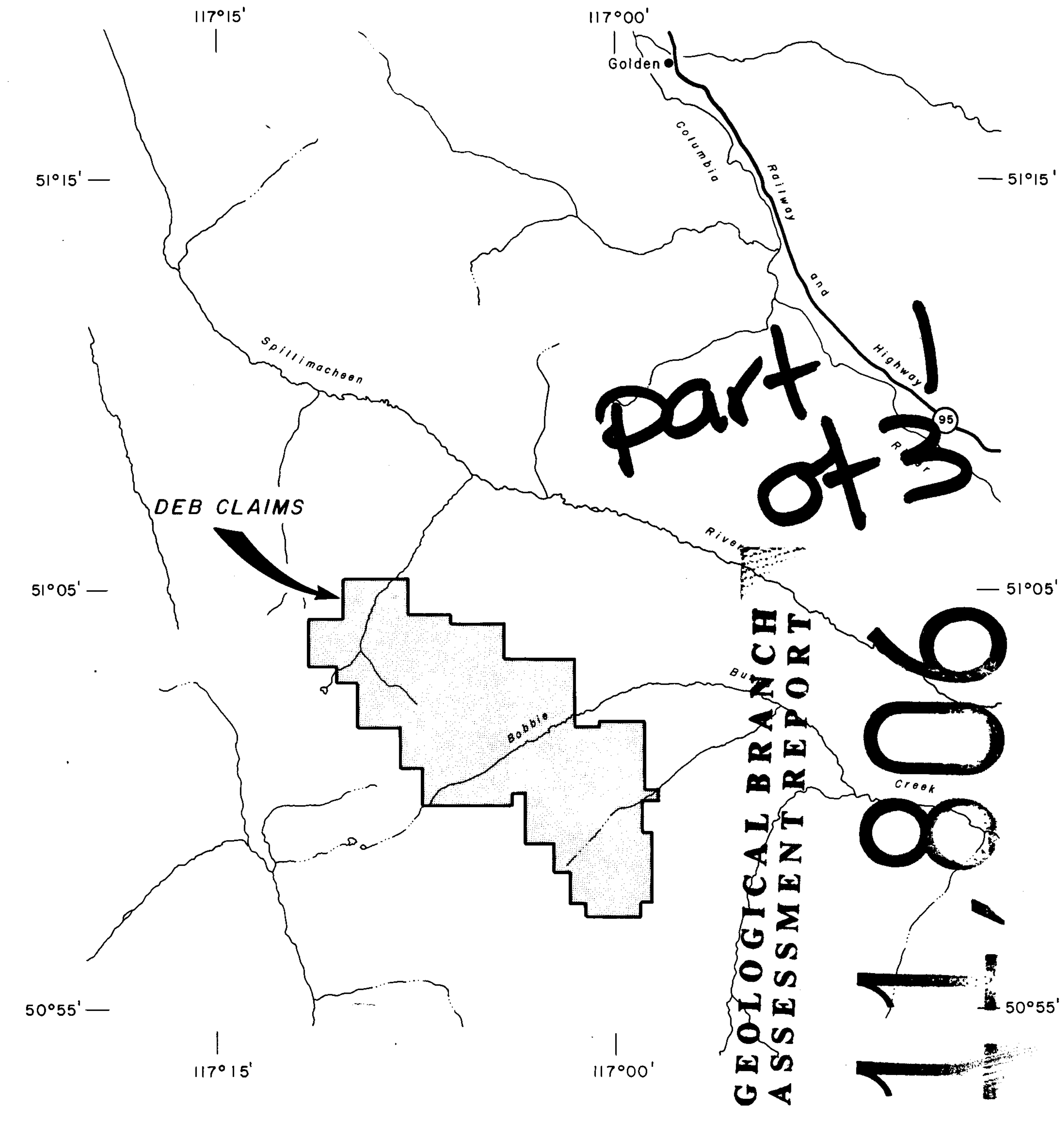
The DEB claim group forms a belt 18 kms long trending southwest through Latitude 51°N, Longitude 117°W (Figure 1).

The property is in southeast British Columbia, 25 kms southwest of Golden on the Trans-Canada Highway and the CP main line. Access is by helicopter from Golden where Okanagan Helicopters Ltd. maintain a permanent base. Certain parts of the property can be reached by logging roads originating at Parsons on Hwy. 95. Although useful for emergencies and partial access for heavy equipment such as diamond drills, these roads are not suitable for daily access to the property. During the 1983 program the field crews were stationed in Golden (The Arl Inn Towner Motel), though emergency accommodation facilities were established in each work area.

The project covers well-forested, and locally logged, ground at 1650 metres a.s.l. through to glaciers, snow fields and bare-rock mountain ridges at 2550 metres a.s.l. The greater part of the ground work since the original stream-sediment geochemical survey in 1979 has been close to or above the tree-line at about 2100 metres, where outcrop is plentiful.

The DEB claims lie within the Purcell Mountains, mostly within the Spillimacheen Range and on the northeast side of the divide between the drainage into the Spillimacheen River on the east and the Beaver River on the west. These ranges trend east-northeast and are drained by, from north to south, McMurdo Creek, Bobbie Burns Creek and Malachite Creek, into the Spillimacheen River.





SCALE 1:250,000

5 0 5 10 15 20 Km

SAMIM CANADA LTD.

DEB PROJECT

LOCATION MAP

PLAN No.	DRAWN	DATE	FIGURE
420	R.V.L. /e.d.s.	Oct. 1982	1
Revised		N.T.S. 82 N, K	

MINEQUEST EXPLORATION ASSOCIATES LTD.

EXCLUSIVE DRAFTING SERVICES LTD.

3. OWNERSHIP AND CLAIM STATUS

The DEB claim group consists of 31 claims totalling 412 units owned by Samim Canada Ltd., and covered by a joint-venture between Samim and First Nuclear Corporation.

The claims, record numbers and anniversaries are listed in Table 1.

Claims or crown grants which fall within or impinge upon the DEB claims and which do not belong to Samim Canada Ltd. are listed in Table 2.

During the year an attempt was made to negotiate a lease or option on the Crown Point crown grants of Beverley Mines Ltd. (now the Mellon Corporation). A number of significant showings had been observed on this property during the 1982 reconnaissance mapping, prospecting and geochemical sampling. However, due largely to the environmental concerns of the Mellon family, no agreement could be reached.

TABLE 1

GROUP	CLAIM NO.	RECORD NO.	UNITS	PRESENT EXPIRY DATE	NEW EXPIRY DATE AFTER SUBMITTING THE 1983 WORK
1	DEB 1	450	8	Sept., 1986	Sept., 1992
	DEB 2	451	8	Sept., 1986	Sept., 1992
	DEB 3	452	4	Sept., 1986	Sept., 1992
	DEB 4	453	20	Sept., 1986	Sept., 1992
	DEB 5	454	20	Sept., 1986	Sept., 1992
	DEB 6	455	4	Sept., 1986	Sept., 1992
	DEB 10	533	18	Jan., 1987	Jan., 1993
	DEB 11	534	12	Jan., 1987	Jan., 1993
	DEB 81	695	4	June, 1987	June, 1993
			98		
2	DEB 7	530	4	Jan., 1986	Jan., 1986
	DEB 8	531	16	Jan., 1986	Jan., 1986
	DEB 9	532	12	Jan., 1986	Jan., 1986
	DEB 12	535	14	Jan., 1986	Jan., 1986
	DEB 13	575	9	Jan., 1986	Jan., 1986
	DEB 14	536	20	Jan., 1986	Jan., 1986
	DEB 15	537	16	Jan., 1986	Jan., 1986
	DEB 21	579	9	Jan., 1986	Jan., 1986
			100		
3	DEB 16	538	20	Jan., 1986	Jan., 1986
	DEB 17	539	20	Jan., 1986	Jan., 1986
	DEB 20	578	18	Jan., 1986	Jan., 1986
	DEB 33	551	20	Jan., 1986	Jan., 1986
	DEB 55	573	20	Jan., 1986	Jan., 1986
			98		

TABLE 1 (cont'd)

GROUP	CLAIM NO.	RECORD NO.	UNITS	PRESENT EXPIRY DATE	NEW EXPIRY DATE AFTER SUBMITTING THE 1983 WORK
4	DEB 51	569	4	Jan., 1986	Jan., 1990
	DEB 52	570	20	Jan., 1986	Jan., 1990
	DEB 53	571	10	Jan., 1986	Jan., 1990
	DEB 54	572	20	Jan., 1986	Jan., 1990
	DEB 56	574	20	Jan., 1986	Jan., 1990
	DEB 79	634	8	Mar., 1986	Mar., 1990
	DEB 80	635	8	Mar., 1986	Mar., 1990
			90		
NOT GROUPED	DEB 82	1203	20	Sept., 1984	Sept., 1984
	DEB 83	1204	16	Sept., 1984	Sept., 1984
			36		

TABLE 2

LIST OF CLAIMS AND CROWN GRANTS NOT OWNED EY SAMIM CANADA LTD.

Claims

"Good" - 17342		Yvonne Slaatten
"Very Good" - 17343		Box 126, Golden, B.C. (1980)
		good until Nov. 24, 1984.

Reverted Crown Grant

L542 rev)		
L543 rev)	Cochrane Oil & Gas	
L3951 rev)	Held under Mineral Reserve.	
L3952 rev)	Gordon Franklin Dixon,	
L3953 rev)	1500/321 8th Ave. S.W.	
)	Calgary. (Home Oil Tower)	
L651 rev	"Monitor"	Cochrane Oil & Gas
	408(9)	good until Sept. 7, 1985.

Crown Grants

L544	Abbott, H.G. deceased, c/o The Permanent Account #K0016, Box 10152, Pacific Centre North 701 West Georgia Street, Vancouver, B.C.
L652	Scovil, F. Alice and McRae, W.J. 2423 Central Avenue, Victoria, B.C.
L776)	
L777)	
L1002)	Scovil, F. Alice
L1982)	2423 Central Avenue
L1114)	Victoria, B.C.
L1115)	
L6650	
L6651	
L6652	
L6653	
L6654	
L6655	Beverley Mines Ltd. (Mellon Corporation)
L6656	c/o Richard Mellon
L11631	Box 186
L11632	Abbotsford, B.C.
L11633	
L11634	
L11635	
L11630	? as above

4. REGIONAL GEOLOGY

The DEB claims cover a thick sequence of Proterozoic sediments exposed in the core of the Purcell Anticlinorum which trends northwest-southeast along the west side of the Rocky Mountain Trench.

As mapped by Okulitch and Woodsworth (1977), the anticlinal structure is complicated by a series of thrust faults running parallel to the anticlinal axis. Price and Mountjoy (1970) suggest, from the evidence of metamorphic isograds, that the anticlinorum is cored by rocks of the Shuswap Metamorphic Complex.

Southwest of Golden in the area known as the Northern Purcell Mountains, the rocks exposed in the core of the anticlinorum belong to the Horsethief Creek Group, itself a subdivision of the Windermere Supergroup. The Horsethief Creek Group is divided into four divisions (Evans, 1933; Young et al, 1973), from a grit division at the base through slate and carbonate divisions to an upper clastic division at the top. To the south of the DEB claims in the central Purcell Mountains the grit division is underlain by the Toby Conglomerate, a diamictite of only local extent.

The rocks exposed on the DEB claims belong to the grit division which in the vicinity of the claims consists of a series of prominent grit and quartzite members separated from one another by recessive shales. The very base of the Horsethief Creek Group is exposed in the axis of the Purcell Anticlinorium on the property, and consists of black, carbonaceous, sideritic, pyritic shales, with minor limestones and mafic tuffs, interbedded with the grits and quartzites and more typical shales.

5. HISTORY AND PREVIOUS WORK

Most of the mineral occurrences within or close to the DEB claims listed in the public record were first worked during the last twelve years of the nineteenth century. A second pulse of activity took place in the period 1920-1940.

Work during these two periods was directed at silver and gold in quartz veins. Lead and zinc are mentioned in nearly all occurrences, copper in one. Occasional mention is made of "limestone replacement". A listing of summaries of previous work, most of it published in the Ministry of Mines Annual Reports, was appended (Appendix 4) to the 1982 report.

Except for those by the First Nuclear Corporation and Samim, no assessment reports have been filed on the claim area.

The writers are not aware of any public documentation of the potential of the area for lead and zinc in shales although evidence was found of staking in the 1960's and 1970's.

Not until FNC began geological mapping and stream sediment geochemistry was there activity to match that of the late nineteenth century and the period before the second world war.

Government mapping has been limited. GSC map 4-1961 covers all but the south end of the claim block but detail in the claim area is lacking. Even recent mapping to the east of longitude 117° (GSC maps, 1502A and 1502B) leaves the Windermere rocks undivided.

The Federal-Provincial National Geochemical Reconnaissance Program touches the south end of the DEB claims south of 51° north and identifies this area as very anomalous in zinc, copper, lead, iron and tungsten and as weakly anomalous in silver and manganese. However, as the samples were collected in Vermont Creek where work at the Ruth-Vermont Mine will have added to metal content of the stream sediments, high values can be expected and may not mean much.

In 1979 Norcen Energy Resources Ltd. optioned the holdings of Cochrane Oil and Gas Ltd. between Vermont and Warren Creeks and carried out a program of geological mapping, prospecting, geochemical soil sampling, geophysics and diamond drilling.

In 1980 Norcen continued to work on the same area with a program of geological mapping, regional and detailed geochemistry, geophysics and diamond drilling.

In 1982 and 1983 additional programs were carried out on these claims by Cochrane Oil and Gas and Bluesky Oil and Gas Ltd., including diamond drilling.

In 1979 and 1980 the First Nuclear Corporation staked a substantial number of claims from McMurdo Creek at the north end to the northern boundary of the Cochrane ground just north of the Ruth Vermont Mines following the results of a 1979 stream sediment geochemical survey. Field work in 1980 included geological mapping, prospecting and geochemistry.

In 1981 the First Nuclear Corporation continued exploration of the DEB claims with geological mapping, sampling and prospecting. At the end of this program the size of the claim group was reduced to 376 units covering the favourable and anomalous stratigraphy.

In 1982 Samim Canada Ltd., through MineQuest Exploration Associates Ltd., working on contract to Samim, further explored the DEB claims, principally through geological mapping, prospecting, reconnaissance soil geochemistry, mostly on widespread contour lines, and rock-sampling and trenching. This was all described in the 1982 report on the joint venture properties that was prepared by MineQuest (Rept. # 82-823-10823).

6. WORK CARRIED OUT IN 1983

The 1983 program was carried out by a crew of five Samim personnel, supported at various times by a geophysical crew of four from Phoenix Geophysics, and geochemical sampling crew of four sub-contracted from MineQuest Exploration Associates Ltd., and a diamond drilling crew of four from Drilcor Industries Ltd. All the personnel were based at the Arl Inn Towner motel in Golden, with access to the property principally by helicopter from the Okanagan base in Golden.

Prior to the field season additional analyses were completed on soil samples collected in 1982, and further statistical interpretation completed on the 1982 rock-chip samples (Appendix A). A new orthophoto was prepared of the Malachite Creek area, and a photo-mosaic of the Silent Lake area by Pacific Survey Corporation.

The field program in August and September consisted of geological mapping, an induced polarization and resistivity survey, soil-geochemical sampling on grids and additional reconnaissance contour-lines, and diamond drilling.

The purpose and scope of each of the activities is described below.

Geological Mapping. The 1982 program had established a generalized stratigraphic column for the property in mapping from Malachite Creek in the south to Crown Point in the north. The 1983 program extended the mapping at 1:5,000 on the basis of the 1982 generalized stratigraphic column to the northwestern limit of the property in the Silent Lake area (Figure 2).

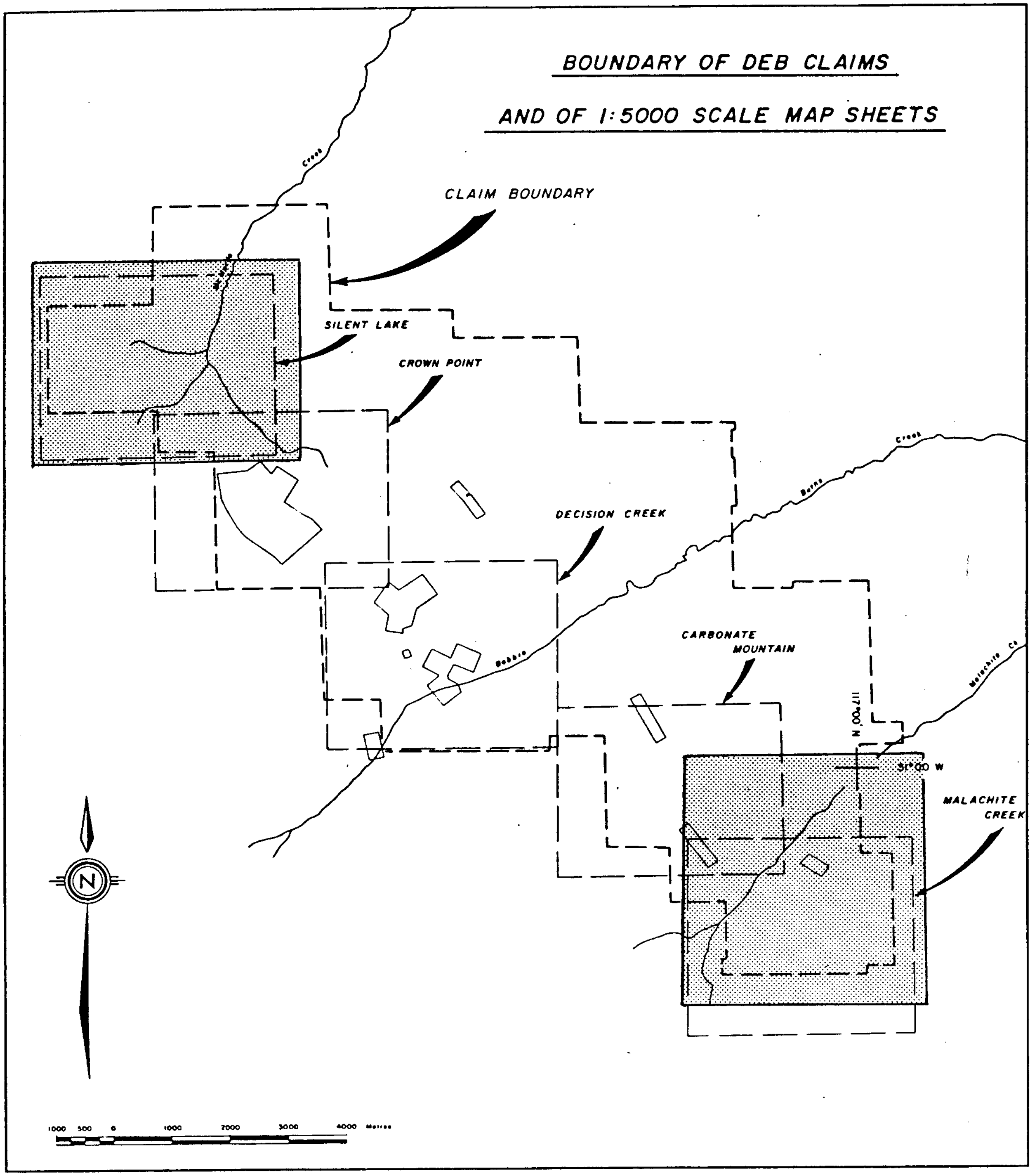

BOUNDARY OF DEB CLAIMS
AND OF 1:5000 SCALE MAP SHEETS
CLAIM BOUNDARY
SILENT LAKE
CROWN POINT
DECISION CREEK
CARBONATE MOUNTAIN
MALACHITE CREEK
N
1000 500 0 1000 2000 3000 4000 Metres

FIGURE 2

Far more detailed mapping at 1:2,500 was undertaken on either side of Malachite Creek in the "Malachite-Detail" and Carbonate Mountain areas, in order to better interpret the geophysical data and to locate the diamond drill holes.

Geophysical Survey. An induced polarization and resistivity survey was completed over five lines in the Malachite Detail area with a 50 metre dipole-dipole configuration to n=6. Parts of two lines, and an intermediate line were subsequently re-surveyed with 10 metre dipoles to n=6. Two lines were surveyed using a 50 metre dipole interval in the Carbonate Mountain area of Malachite Creek, and part of one line in the "Crown Point cabins" area on the Silent Lake sheet. In total 7.67 line kilometres were completed with 2122 readings and 254 stations occupied.

Soil Geochemistry. Soil geochemical samples were taken at 20 metre intervals along a series of reconnaissance lines in the Silent Lake area, generally along contours located downslope or overlying favourable stratigraphic units. Six of these lines were completed in the Silent Lake area, located on the basis of the 1983 mapping results. Three similar lines were located on either side of Malachite Creek in order to better define, extend, and indicate the source of anomalies located in this area in 1982. Six grid lines were sampled in the Crown Point cabins area to extend and delineate an anomaly located on reconnaissance lines in 1982. These lines cross the favourable stratigraphy. Two similar lines were surveyed on each of the Carbonate Mountain and Malachite Creek areas. A limited number of silt samples were collected where soil lines crossed appropriate drainages. In total 1096 samples were collected and analyzed for Pb, Zn and Ag. Subsequently these analyses have been reviewed statistically in order to identify anomalous areas.

Rock Sampling. A limited number of rock samples were collected during the geological mapping. One trench was dug, sampled, and the adjacent stratigraphy chip-sampled around the "SR" showing in the Malachite Detail area. A total of 34 samples were analyzed for Pb, Zn and Ag, with two of these also for copper and gold and 12 of these also for gold.

Diamond Drilling. Eleven diamond drill-holes were drilled for a total of 493 metres. Three of these tested the "SR" showing, but only intersected zinc-anomalous shales, which are now interpreted to lie entirely in the footwall of the showing which lies in a small synclinal fold. Five holes tested the Malachite Trenches mineralization identified in 1981 and trenched in 1982, with one of these testing a strong, near-surface IP anomaly on a line between the trenches. This hole returned high grade massive-sulphide over a narrow interval as well as adjacent, stratabound mineralization, whereas the other holes returned only minor or no significant mineralization. Three holes were completed on the "Malachite Adit" showing of bedded sphalerite, and though none intersected the conformable mineralization one cut a massive arsenopyrite vein, with minor lead-zinc. Subsequently 193 samples of core were analyzed for Pb, Zn and Ag at the geochemical level, and eight were variably assayed for Pb, Zn, Ag, Cu and Au, major and minor elements and by 30-element semi-quantitative spectrography. Seven polished sections were made and interpreted on the mineralization, along with 37 thin-sections of rock-specimens from the core.

7. STRATIGRAPHY

The stratigraphic sequence on the DEB property was established in 1982 and consists of dark-grey to black shales with interbedded limestones, alternating with thick bedded, coarse grained, grey to brown orthoquartzite sandstones and grits. The sequence was divided into seven alternating fine-grained coarse grained units from A (at the base) to G (Figure 3). This sequence was re-confirmed and extended in the 1983 mapping with only minor changes in detail, mostly in subdividing some of the units, and extending the favourable black-shale bearing sequence to a unit below the "A" grit.

The various units can be traced with considerable certainty over most of the property, though there are a few isolated fault-bounded blocks within which the stratigraphic interpretation remains enigmatic. As in 1982, the fine-grained units were studied in most detail because of their potential as hosts for base-metal mineralization. The various shales could generally be classified into two classes. One of these is very black, carbonaceous, contains considerable "siderite" (up to 25%) as discrete beds and laminae, as well as disseminated throughout the shales, and variable pyrite, up to 10% locally; it is generally very well-bedded and laminated with "black"-layers dominant over "grey" layers in thin couplets, and is usually the host to the various types of limestone beds, as well as all the known base-metal and silver mineralization. The second type of shale is generally well-bedded but with "grey" layers (more silt-rich) far thicker (5-15 cm) than the black (more argillaceous) layers, which are usually less than 1 cm thick.

STRATIGRAPHIC COLUMN

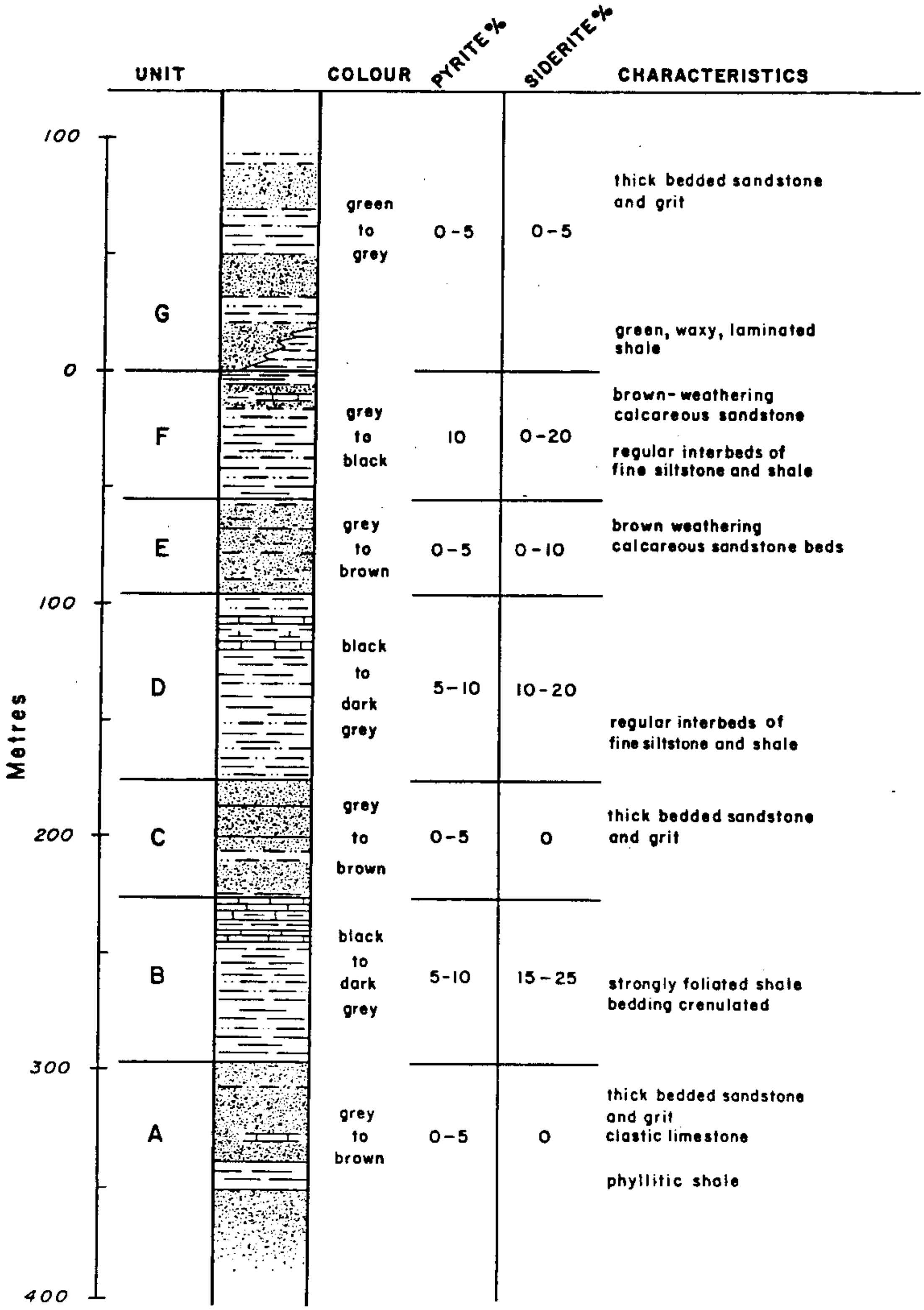


FIGURE 3

The various limestones include massive, black, pyritic, calc-siltites, gritty calcarenites with discrete quartz-grains in a calc-siltite matrix, distinct oncolitic bearing beds, and limestone syn-sedimentary, intraformational breccias containing fragments of shale, graphite and bedded carbonates. These grade laterally into calcareous shales or pinch-out within the black-shales. No distinct dolomites were identified.

Within one of the grit units (the top of "E") there is a distinctive interlaminated unit of black and grey quartzite, with the various laminae from a few millimetres to less than one centimetre thick.

Bedding in the fine-grained unit is very planar and continuous (at outcrop scale), suggesting deposition in a quiet environment. The coarse grained units can be followed continuously over large distances, with planar bedding, and no obvious lensoid construction. They are occasionally graded from a pebble conglomerate base to a grit top, but only rarely pass upward into finer grained beds, and then only at distinct stratigraphic breaks to the shale units. Within the coarser units there are occasionally rip-up clasts of shale in the basal beds, indicating some irregularity or facies-changes on the apparently planar bedding surfaces. Generally however the extreme planarity at all scales suggests a very quiescent depositional environment below wave-base, and probably on an abyssal plain, with deposition of the coarser units by turbidity currents either down-slope or along-slope as "contourites".

7.1 Unit As

A distinct black shale with limestones is observed in two horizons at low elevations in the "Crown Point cabins" area covered by the soil-geochemical grid and IP line as well as on Silent Mountain,

The two horizons at Crown Point Cabins may be separate units, with an intervening grit, or a fault or fold repetition of the same unit, as they are close to the position of the main anticlinorial axis wherein smaller-scale structures are quite common. Being seen only at low elevations, within a thick forested and talus covered area these shales are only exposed in widely separated stream-cuts. The shale is black, micaceous with about 5% disseminated siderite, and very finely laminated. Beds of massive, black, pyritic limestone, typically 1-5 cm thick (up to 10 cm), are interbedded in the shale and in finely laminated shale and limestone. At Silent Mountain this unit contains more siderite (up to 10%), the limestones are gritty and up to 20 cm thick, and the unit contains thin (<5 cm) grit beds.

7.2 Unit Ag

This is a thick-bedded, very coarse grit, commonly with basal conglomerate seen in the Silent Lake and Crown Point area, generally forming steep cliffs at low elevations.

7.3 Unit Bs

Unit Bs outcrops extensively in the Crown Point area where it is the host to the Crown Point mineralization and the RB and TJ showings discovered in 1982. An excellent and complete section was observed in the waterfall southeast of the Crown Point cabins. Here it is a very finely-bedded and micro-planar laminated black-shale with distinct siderite beds and minor bedded pyrite, as well as disseminated siderite. Rare grey beds, presumably somewhat more silty become thicker towards the base and in parts dominate as 3-10 cm beds (rarely up to 15 cm) with interbedded less than 1 cm black bands. However siderite continues throughout, with more abundant disseminated siderite at the base of the thicker grey, silt beds. At Crown Point this unit contains a distinct upper limestone, which is however missing beneath the "C" grit in the Crown Point cabins area. Here the basal grit contact is very sharp, and the grits contain abundant shale rip-up clasts, suggesting a possible area of local intraformational erosion. There is similarly no carbonate within the top of the B shale on Sunday Lake ridge. However it is present on the Silent Mountain section as wavy-banded and laminated limestone in beds 1-10 cm thick with black-shale with abundant pyrite and some siderite. The shale in this section contains interbedded siderite bands 1-4 cm wide, and is also generally quite muscovitic.

7.4 Unit Cg

This grit is very massive, fine to medium-grained and thick bedded ($\simeq$3 m) with little obvious grading, and either no, or very thin shale interbeds. It contains up to 20% siderite.

7.5 Unit Ds_1

At both Silent Lake and on "Malachite Detail" two distinct shales were mapped. The lower shale is generally well-bedded with grey beds dominant over black, and contains minimal siderite, either bedded or disseminated.

7.6 Unit Ds_2/Dc

The dominant shale, at the top of the D unit on both the Silent Lake and Malachite Detail sheets, as well as the shale seen on Carbonate Mountain is very black, clearly carbonaceous (locally graphitic), very sideritic, both as beds and disseminated, contains abundant pyrite, and is the host to distinct limestone horizons and thin mafic tuffs.

The limestones of Silent Lake are thin (2-10 cm), usually gritty, massive beds that are often boudined in tight folds within highly crenulated shales. At Malachite Detail they are a very distinctive black oncolitic unit that becomes a coarse breccia containing carbonate, shale and graphite fragments with a coarse, vuggy, pyritic limestone matrix.

Thin, massive beds of highly altered, mafic volcanics are present within this unit, particularly in association with the mineralized areas of Malachite Trenches. It consists dominantly of carbonate (70%) but contains muscovite (10%) and a distinct green serpentine or chlorite after original olivine . These are described further under diamond drilling.

7.7 Unit Eg_1 and $_2$

There are, at both Silent Pass and Carbonate Mountain, two very similar grit beds, separated by a shale unit, which together form Unit E. The grits are generally fine grained, white quartzite, with quite frequent thin (3-5 cm) shale interbeds, and at the base are very flaggy. The upper grit is generally somewhat coarser, more massive and thicker bedded with minor pebble conglomerate bases to each bed.

Both grits are gradational to the surrounding and intervening shales . On Malachite Detail the E grit is a single horizon that is very well-bedded to laminated, and fine-grained. It locally appears porcelainous. At the top there is a distinctive horizon of finely-laminated, alternating black and white beds, referred to as a "laminate".

7.8 Unit Es

This shale horizon separates the two E grits at both Silent Lake and on Carbonate Mountain. It is well-bedded, 3-15 cm thick (typically 10 cm) with the grey, silty layers 1-3 cm thick relative to less than 1 cm of black argillite at the top. It usually contains minor pyrite euhedra, and only minor beds of siderite. The contacts with the grit beds are generally gradational.

7.9 Unit Fs_1/Fc

At Malachite Creek (Malachite Detail and Carbonate Mountain) the F shale can be divided into a lower unit of very black shale containing abundant carbonate beds and an upper of very-well bedded grey-green shale. At Silent Lake only the lower, black-shale and carbonate is present. In the 1982 mapping only the lower black-shale was included in Unit F, but this resulted in this major contact being placed within a shale unit, at basically a colour change. This colour change may be due to alteration, rather than a primary feature, and does not obviously correspond to any change in bedding characteristics. The thickness changes in the shale may reflect original depositional basins, particularly as the overlying basal G grit seems to be traceable across the property as a continuous horizon. For these reasons the F/G contact was moved up to the base of the first green grit.

The lower (1982 only) black-shale is very black, probably carbonaceous (graphite bedding planes), thin bedded and finely laminated, with grey beds less than one cm thick, compared to 10 cm thick black beds. It contains abundant euhedral pyrite and siderite beds 2-3 cm thick, at a frequency of about 1 every metre, as well as about 5% disseminated siderite. At Malachite from the base up, and at Silent Lake at the top, this black-shale contains abundant limestone beds and/or is very calcareous

At Silent Lake there are generally massive, grey, limestones representing about 20% of the total section, with thinner wavy-banded, and gritty layers within the shales. The uppermost beds are often highly contorted with extreme micro-folding and intense crenulation, as well as boudinage of the more resistive, massive carbonate layers. On both Sunday Lake ridge, and the northermost exposures on Silent Mountain there is a thin unit of the upper F shale above the carbonate and black-shale sequence.

At Carbonate Mountain a thick section of calcareous shale and thinly bedded limestones in shale is present throughout much of the lower F shale. Towards the south, at lower elevations, the carbonate bearing interval appears to be higher in the section.

Malachite Detail area, looking southwest. The light band, horizontally across the centre is the "E" grit. The brown area below it(in shadow)is the altered area of Malachite Trenches in "D" shale. The SR showing is at the intersection of the two arrows.

Malachite Detail, folds in "F" shale-carbonate.

Malachite Detail,
boudinage structures
in "D" limestone and
in "D" quartzite.

At Malachite Detail the lower F shale is highly calcareous throughout, where it is exposed in a series of closely-spaced, low amplitude folds. Towards, or at the base directly overlying the "E-laminate" it contains a relatively distinctive limestone horizon, very gritty or semi-massive, and relatively thick bedded, up to 3 metres thick, underlain by 1.5 metres of thin bedded, crenulated and laminated limestone and shale. This unit is the host to the Malachite Ridge showing, in the uppermost, westerly part of the carbonate, and immediately underlies the Malachite Adit showing. The shales also contain abundant siderite, both as discrete thin beds and disseminated throughout, as well as frequent bedded layers of coarse, euhedral pyrite. Near the SR showing and in the drilling at the Adit showing there are also highly altered mafic volcanics identical to those in the Ds_2 shales, and as described below under diamond drilling.

7.10 Unit Fs_2

At Malachite Detail, Carbonate Mountain, and very locally at Silent Lake there is a sequence of grey-green, well bedded shales that are very phyllitic and waxy, generally silty, with locally low angle cross-bedding, and only thin black layers.

7.11 Unit Gg

The basal "G" grit is coarse, thick bedded and distinctly green in colour. It occasionally contains quartz-pebble conglomerate layers, and very rarely a thin shale interbed.

7.12 Unit Gs

The "G" grits are interbedded with grey-green, phyllitic and waxy shales, with only thin black, laminae locally present.

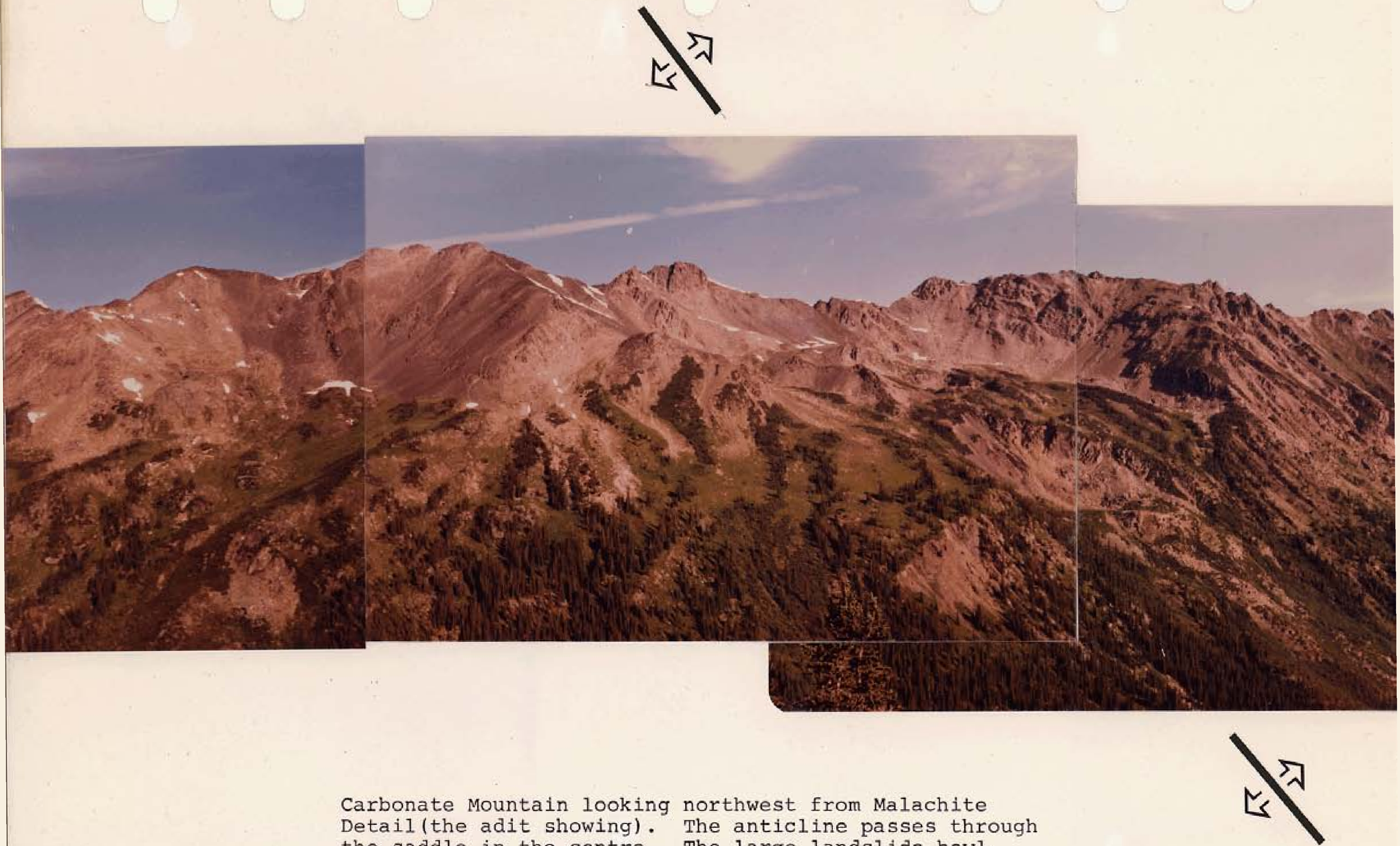
8. STRUCTURE

8.1 Secondary Structures

The entire sequence exposed on the DEB property is within the main Purcell Anticlinorium, and is hence the lowermost exposures of the Horsethief Creek Group of the Windermere Supergroup. The anticlinorium is in detail a series of anticlines and synclines which have a cylindrical folding style. Within the finer grained units more intensive drag-folding is developed, with local isoclinal folds, particularly in areas of marked contrast of competence, such as shale to limestone or grit contacts.

Foliation is strongly developed in the finer grained units and is always vertical and parallel to the major fold axes. Most of the finer grained rocks are a slate and break along the foliation-cleavage planes. There appears to only have been one phase of folding that has deformed these rocks.

In certain units of marked competency beds have been boudined with typical flowage of the shales around the pulled-apart limestones or grits. In some areas the more competent beds have developed a dominantly vertical orientation in a series of upright, parallel lenses. As a result the measurement of isolated dips in the field can often be very misleading. Overall the finer grained-beds have developed subsidiary drape folds on the limbs of the major fold, with the steeper limbs of these secondary folds tending to be sheared out in the foliation. As a result only the shallower limbs are preserved and their dips recorded, suggesting a flatter local dip than the more regional dip of the primary folds.



Carbonate Mountain looking northwest from Malachite Detail(the adit showing). The anticline passes through the saddle in the centre. The large landslide bowl right of centre is mostly in "D" shale. The grassy meadows are developed on "F" shale, with the right foreground cliff in "E" grit.

Carbonate Mountain, from Malachite Detail.

Some of the larger folds have a "top-hat" on box-like form with relatively steep sides and flat-tops. This is particularly well demonstrated in a fold to the southwest of the area mapped on Carbonate Mountain. It is also probably the type of fold underlying much of Malachite Detail, with its steep dips on the southwest in the upper unit Fs_2, and flat or gently northeast overall dip in Fs_1, Eg and Ds.

The axes of the folds are locally faulted-out, particularly at Malachite Detail, where the entire northeast limb appears to have been truncated. This same fault is present on the opposite side of Malachite Creek on Carbonate Mountain, where its effects are far smaller. Numerous faults with smaller displacements were mapped and interpreted from air-photographs. At Silent Lake the orientation of the Crown Point and Silent Pass valleys appear to be controlled by down-dropped blocks with north-south and northeast-southwest orientations respectively. Major east-west lineaments were also noted at Silent Pass, similar to those on a larger scale controlling Malachite Creek and Bobbie Burns Creek, but with little or no apparent offset in either case.

No major thrust faults have been identified within the property, though they are known to be present in the area with displacements from both east and west.

8.2 Primary Structures

There are very few primary structural features exposed within the finer grained units. The grits often display graded bedding and basal rip-up clasts. Very rarely, such as in the Fs_2 shales, there are minor areas of apparent low-angle cross-bedding. However most of the bedding features are highly planar, with lamination and parallel-bedding being very dominant. Minor brecciation, which is probably syn-sedimentary and intraformational is seen in the Dc limestones on Malachite Detail, with an apparent thickening in this area of the surrounding Ds_2. This may however be a result of alteration, rather than primary bedding thickness. The marked increase in strike width of the Fs_1 shale on Malachite Detail to the southeast is due to structural repetition with, as a result of the structural complication, no possibility of determining any primary bedding thickness changes.

The appearance and disappearance of the carbonates within B, D and F shales could be a reflection of original local basins of deposition, or of truncation by the respective overlying grits.

The marked change in unit E, from a thick Eg_1-Es-Eg_2 on Carbonate Mountain to a thin Eg on Malachite Detail, and the corresponding change in thickness of F to include a thick upper Fs_2 on Malachite Detail would suggest a major facies change with a boundary corresponding approximately with Malachite Creek. At a smaller scale the change in thickness of F shale, and the position of the carbonate horizon, would suggest a local basin within F centered on IP line 10 at Carbonate Mountain.

9. GEOCHEMICAL SOIL SAMPLING

Soil samples were taken at 10 or 20 metre intervals on lines which were either along contours at appropriate levels down-slope of prospective units, or which crossed the strike of these units. With the exception of a small follow-up grid at Crown Point Cabins and some lines at Malachite Creek these lines were all designed to provide the initial reconnaissance coverage of these units.

The purpose of these soil lines was to detect the presence of mineralization, rather than to outline specific anomalies for comparison between them. Therefore considerable latitude was given in the search for suitable sample sites. Some difficulty was encountered in recovering lines sampled in 1982 so that a greater effort was made to mark the sample sites by flagging on trees, as well as in the sample hole. Where streams were encountered in the course of a reconnaissance line a silt sample was collected. All silt samples were treated separately and not included with the soil results for that line.

Samples were sent to Vancouver Geochemical Laboratories where they were dried and sieved to minus 80 mesh, and analysed by Atomic Absorption Spectrometry for Pb, Zn and Ag (detection limits of 2.0, 1.0 and 0.1 ppm respectively). The analytical sheets are given in Appendix B.

TABLE 3

LIST OF 1983 SOIL LINES

AREA	LINE	NUMBER OF SAMPLES	TOTAL LENGTH
Silent Lake	S2	181	3620 m
	S3	50	1000 m
	S4	195	3900 m
	S5	91	1820 m
	S6	50	1000 m
Crown-Point	P13	105	2100 m
	P13C	21	210 m
	4+50N	13	260 m
	6+25N	18	360 m
	8+25N	18	360 m
	10+25N	18	360 m
	16+00N	15	300 m
Carbonate Mountain	C10	35	350 m
	C11	70	1400 m
	C12	20	400 m
	IP L.9	71	710 m
Malachite Creek	M1	15	150 m
	M3	60	1200 m
	M4	20	200 m

The characteristics of each soil line listed in Table 3, the individual sample numbers and the analytical results are given in Appendix D. Locations of Soil Lines are shown on Dwgs. DEB-83-2, -3 and -4. The sample number of every fifth sample is given, along with the analytical results for Pb and Zn for anomalous samples (whether anomalous in one or both elements) and a bar graph with thin and thick lines for possible and probable anomalies respectively, for both Pb and Zn.

9.1 Re-analysis of 1982 Results

The 1982 soil samples were composited into groups of five contiguous samples and an analyses for Pb and Zn made of the composite. Review of the results on the composite samples suggested anomalous thresholds as:

	Probably Anomalous	Anomalous
Lead	45	70
Zinc	95	130

These were set relatively low, at essentially the one and two standard deviation levels to allow for the possible dilution of one or two anomalous results within the composite.

Review of the resulting anomalies on the individual maps led to the suggestion that some of the anomalies were caused by differences in background level according to whether the underlying, and immediately upslope, unit was black-shale or grit; in other words whether a bimodal population existed. Review of the data, in light of this geologically adjusted background, led to the identification of those anomalies that were more probably real, and particularly those related to a prospective shale horizon. As a result 160 individual samples were selected for re-analysis as on Table 4, with the results and the original composite results given in Appendix E. A number of significant anomalies were identified from these re-analyses, principally on lines P7, P8, P9, P10 in the Crown Point Cabins area on lines C5, C6 at Carbonate Mountain, and on line M2 at Malachite Creek. The very high results on line M1 were known to be due to downslope dispersion in scree beneath the Malachite Ridge showing. These re-analyses were integrated into the 1983 sampling for statistical purposes and are discussed further below for each area and line.

TABLE 4

LIST OF 1982 COMPOSITE SAMPLES THAT WERE RE-ANALYSED

AREA	LINE	NUMBER OF COMPOSITES	NUMBER OF SAMPLES
Silent Lake	S1	2	10
Crown Point	P2	1	6
	P4	1	5
	P5	1	6
	P6	1	5
	P7	1	5
	P8	1	5
	P9	3	14
	P10	1	5
	P11	1	5
	P12	1	5
Malachite Creek	M1	4	20
	M2	3	15
Carbonate Mountain	C5	8	40
	C6	3	15

9.2 Summary Statistics

The summary statistics for lead are given on Table 5 and for zinc on Table 6. For each geographical area and group of lines the mean and standard-deviation were calculated, using all but the highest analytical results. In most cases the co-efficient of variation (the mean divided by the standard deviation) was too high for a normalized population. The population was reviewed and the obvious outliers (or high results) were removed, and new statistics calculated. With these top-truncated (and in one case, at Crown Point cabins, low-end truncated) populations the co-efficients of variation are within an acceptable range, and the mean plus two standard deviations and mean plus three standard deviations were calculated. Because the populations were truncated, and because these numbers are not meaningful with such precision, the possible and probable thresholds were established as the nearest higher number as an integer of 5. In most cases the overall thresholds were established as:

	Background	Possible anomaly	Probable anomaly
Lead	$<$ 60	60-69	70+
Zinc	$<$110	110-134	135+

SOIL GEOCHEMISTRY

SUMMARY STATISTICS

TABLE 5

LEAD

SET	TRUNCATED AT	n	$\bar{x}$	s	x+2s	x+3s	THRESHOLDS POSSIBLE	THRESHOLDS PROBABLE
1982 Re-analysis	>99	145	39.14	19.75	78.64	98.39	>80	>100
C-10,11,12	-	125	43.98	19.61	83.20	102.81	>80	>100
M1,3,4	-	94	67.80	110.98	NOT MEANINGFUL			
P13	-	105	25.86	10.86	47.58	58.44	>50	>60
S2	>199	177	36.02	10.48	56.98	67.46	>60	>70
S3	-	50	26.92	10.21	47.34	57.55	> 50	> 60
S4	-	195	35.76	14.88	65.52	80.44	> 65	>80
S5-6	-	142	44.06	13.95	71.96	85.91	> 70	>85

EXCEPT FOR P13, S2, S3 THESE WERE NOT USED BECAUSE OF THE HIGH CO-EFFICIENTS OF VARIANCE - THE SAMPLE POPULATIONS WERE TRUNCATED TO REMOVE OBVIOUS OUTLIERS, AS FOLLOWS:

SET	TRUNCATED AT	n	$\bar{x}$	s	x+2s	x+3s	THRESHOLDS POSSIBLE	THRESHOLDS PROBABLE
1982 Re-analysis	>59	121 (83%ile)	32.11	12.51	57.13	69.64	> 60	>70
C10,11,12	>59	106 (85%ile)	37.37	11.78	60.93	72.71	> 60	> 70
M1,3,4	> 59	64 (68%ile)	35.17	13.64	62.45	76.09	> 60	>75
P13	-	105 (100%ile)	25.86	10.86	47.58	58.44	> 50	>60
S2	> 199	177 (99%ile)	36.02	10.48	36.98	67.46	> 60	> 70
S3	-	50 (100%ile)	26.92	10.21	47.34	57.55	> 50	> 60

LEAD

TABLE 5 cont'd

SET	TRUNCATED AT	n	$\bar{x}$	s	x+2s	x+3s	THRESHOLDS POSSIBLE	THRESHOLDS PROBABLE
S4	> 59	188 (96%ile)	34.21	11.50	57.21	68.71	> 60	> 70
S5,6	> 59	120 (85%ile)	40.53	10.65	61.83	72.48	> 60	> 70
AVERAGES: P13,S2, S3,S4, S5,S6		640	33.96	10.85	55.67	66.52	> 60	> 70

SOIL GEOCHEMISTRY

SUMMARY STATISTICS

TABLE 6

ZINC

							THRESHOLDS	
SET	TRUNCATED AT:	n	$\bar{x}$	s	x+2s	x+3s	POSSIBLE	PROBABLE
1982 Re-analysis	>199	144	78.82	30.46	139.74	170.20	>140	>170
C-10, C-11, C-12	-	125	81.06	22.63	126.32	148.95	>125	>145
M1, M3, M4	-	94	110.87	165.2	NOT MEANINGFUL			
P13	-	105	66.44	21.20	108.84	130.04	>110	>130
S2	-	181	71.73	59.30	NOT MEANINGFUL			
S3	> 199	49	37.71	19.42	76.55	955.97	> 75	>95
S4	-	195	68.34	23.32	114.98	138.30	> 115	>140
S5, 6	-	141	76.59	26.66	129.91	156.57	> 130	>155

THESE WERE NOT USED (EXCEPT FOR P13 AND S3) BECAUSE OF THE HIGH CO-EFFICIENT OF VARIANCE - THE SAMPLE POPULATIONS WERE TRUNCATED FURTHER TO REMOVE OBVIOUS OUTLIERS AS FOLLOWS:

SET	TRUNCATED AT:	n	$\bar{x}$	s	x+2s	x+3s	POSSIBLE	PROBABLE
1982 Re-analysis	> 119	132 (92%ile)	73.37	24.43	122.23	146.66	> 120	> 145
C-10, C-11, C-12	> 109	114 (91%ile)	77.54	20.33	118.20	138.53	> 120	>140
M1, 3, 4	> 109	71 (76%ile)	54.46	28.24	110.94	139.18	>110	>140
P13	-	105 (100%ile)	66.44	21.20	108.84	130.04	> 110	> 130

ZINC

TABLE 6 cont'd

SET	TRUNCATED AT	n	$\bar{x}$	s	x+2s	x+3s	THRESHOLDS POSSIBLE	THRESHOLDS PROBABLE
S2	>109	169 (93%ile)	61.99	24.32	110.63	134.45	>110	>135
S3	>199	49 (98%ile)	37.71	19.42	76.55	95.97	>75	>95
S4	>109	188 (96%ile)	66.05	20.34	106.73	127.07	>105	>130
S5-6	>109	127 (90%ile)	72.02	23.82	119.66	143.48	>120	>145
AVERAGE P13,S3 S4,S5,S6	>109	638	64.05	22.16	108.37	130.53	>110	>135

For each anomaly an index of anomalousness was calculated, known as the "Co-efficient Score". This is the number of standard deviations greater than the mean of the analytical result, for both lead and zinc, which are then totalled. For a sample exactly at the mean in both Pb and Zn the score would be zero. For a sample with one element at the probable anomaly level of the mean plus three standard deviations and the other at the mean it would be 3.0. Where both elements are probably anomalous it would be 6.0. Where adjacent samples are anomalous in one or both elements the individual co-efficient scores are added together to give the "Total Co-efficient Score" for the anomaly.

Each group of contiguous anomalous results were classed according to the sample considered most anomalous, as follows:

Class 1 - both Pb and Zn in a single sample are probably anomalous;

Class 2 - either Pb or Zn are probably anomalous, with the other element possibly anomalous;

Class 3 - either Pb or Zn are probably anomalous, with the other element being in the background population (less than 2 standard deviations above the mean);

Class 4 - both Pb and Zn are possibly anomalous in a single sample;

Class 5 - either Pb or Zn are possibly anomalous, with the other element being in the background population.

The anomalies by Class, with the individual Co-efficient Scores and the Total Co-efficient Scores, are given in Table 8 for Silent Pass, Table 9 for Crown Point Cabins, and Table 10 for Malachite Creek (including Carbonate Mountain).

9.3 Silent Lake Sheet

Three relatively long and one shorter line were sampled to cover the shales in the Silent Lake area, where all of B, D and F shales are exposed (Dwg. DEB-83-2). The summary results for these lines are in Table 7. Overall 6.2% of the total samples were considered anomalous, with 2.0% considered probably anomalous.

Line S2 covers in a zig-zag pattern the low, grass-meadow flats in the Silent Pass area to the northwest of Silent Lake. Most of these are underlain by shales of unit "F", and some of unit "D". The intervening ridges are mostly unit "E" grits. The most significant anomaly (see Table 8) is on the southeast corner of the area covered, and appears to lie along the north edge of the fault block that is downdropped in Silent Pass. The stratigraphic position of this block is uncertain and though the anomaly is mapped in units ?Fs, ?Gg and higher, these may correspond to Ds, Eg and Fs. The anomaly is extending downslope and could come from the highest, most south-westerly shale, or possibly from the 040° fault to the immediate north. A series of weaker anomalies in zinc are present to the north of these faults apparently coming from the F shale and indicate further prospecting is required, and possibly a small grid along this section of the F/G contact.

TABLE 7

SOIL GEOCHEMISTRY - STATISTICAL SUMMARY
SILENT LAKE

Line	Total Number of Samples	Anomalous Results Pb Possible	Pb Probable	Pb Total	Zn Possible	Zn Probable	Zn Total	Total/As % Possible	Total/As % Probable	Total/As % Total
S-2	181	1	6	7	7	5	12	8/2.2%	11/3.04%	19/5.25%
S-3	50				-	1	1		1/1%	1/1%
S-4	195	7	2	9	5	2	7	12/3.08%	4/1.03%	16/4.11%
S-5	91	13	5	18	14	2	16	27/14.84%	7/3.85%	34/18.69%
S-6	50	1		1				1/1%		1/1%
TOTAL	567	22	13	35	26	10	36	48	23	71
As %		3.88	2.30	6.18	4.59	1.76	6.35	4.23	2.03	6.26

TABLE 8

SOIL GEOCHEMISTRY - SILENT LAKE

ANOMALIES LISTED BY PRIORITY

(Total Co-efficient Score)

LINE	PEAK SAMPLE NUMBER	NUMBER OF ANOMALOUS SAMPLES (all classes)	ANALYSIS-PEAK SAMPLE (ppm) Pb	Zn	Ag	CO-EFFICIENT SCORES *** (individual samples)	TOTAL *** CO-EFFICIENT SCORE
CLASS 1 : PROBABLE ANOMALIES IN BOTH LEAD AND ZINC							
S-2	0666	3	88	173	.4	24.8, 9.9, 3.4	38.0
S-2	0661	2	102	198	.4	12.3, 7.6	20.0
S-4	0206	1	146	147	n.d.	14.1	14.1
S-5	0024	2	76	146	.4	4.0, 7.6	11.6
CLASS 2 : PROBABLE ANOMALY IN EITHER Pb or Zn, POSSIBLE IN OTHER							
S-5	0040	4	72	119	.3	5.7, 6.0, 5.0, 4.3	21.0
S-5	0033	2	73	114	.4	5.8, 5.6	11.5
S-5	0077	1	85	110	.3	6.8	6.8
CLASS 3 : PROBABLE ANOMALY IN EITHER Pb or Zn							
S-3	0360	1	44	730	.6	31.0	31.0
S-2	0673	1	46	550	.8	23.0	23.0
S-2	0606	2	54	209	.3	8.4, 4.0	12.4
S-4	0191	3	42	143	.6	2.0, 4.3, 3.9	10.1
S-4	0220	1	70	86	.2	4.8, 4.3	9.1
S-2	0657	1	97	73	.4	6.2	6.2
S-5	0058	1	45	145	.2	4.7	4.7
S-2	0664	1	74	68	.3	3.9	3.9
S-2	0557	1	75	51	.6	3.2	3.2

*** SEE TEXT FOR DEFINITION AND USE

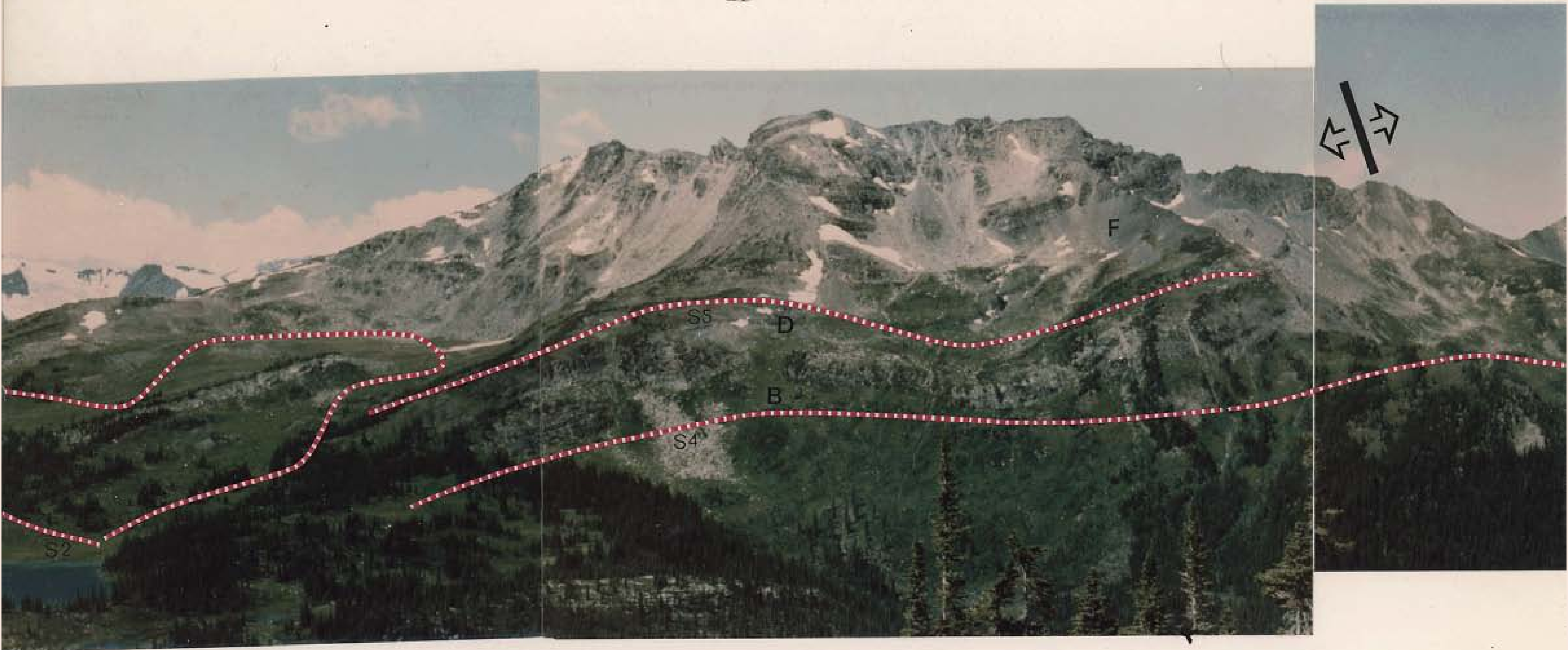
SOIL GEOCHEMISTRY - SILENT LAKE

ANOMALIES LISTED BY PRIORITY

(Total Co-efficient Score)

TABLE 8 cont'd

LINE	PEAK SAMPLE NUMBER	NUMBER OF ANOMALOUS SAMPLES (all classes)	ANALYSIS-PEAK SAMPLE (ppm) Pb	Zn	Ag	CO-EFFICIENT SCORES *** (individual samples)	TOTAL *** CO-EFFICIENT SCORE
CLASS 4 : POSSIBLE ANOMALY IN BOTH Pb and Zn							
S-4	0195	2	61	131	.1	5.2, 5.5	10.7
S-5	0065	2	69	129	.3	1.9, 6.2	8.1
S-5	0037	2	61	111	.4	3.4, 4.6	8.0
S-4	0153	1	69	124	.3	5.9	5.9
CLASS 5 : POSSIBLE ANOMALY IN EITHER Pb or Zn							
S-5	0050	3	55	119	.1	4.3, 4.4, 4.1	12.9
S-5	0092	2	59	119	.2	4.4, 4.8	9.2
S-5	0019	2	67	81	.7	4.0, 3.8	7.8
S-5	0081	2	52	117	.2	4.1, 3.6	7.7
S-2	0642	2	34	123	.5	3.0, 2.7	5.7
S-4	0161	1	66	104	.3	4.8	4.8
S-2	0650	1	58	115	.4	4.5	4.5
S-5	0095	1	59	110	.4	4.4	4.4
S-5	0030	1	63	100	.3	4.3	4.3
S-2	0612	1	50	118	.1	3.9	3.9
S-4	0166	1	67	83	n.d.	3.9	3.9
S-5	0016	1	61	91	.3	3.7	3.7
S-6	0413	1	65	85	.3	3.7	3.7
S-4	0217	1	66	79	n.d.	3.6	3.6



Silent Mountain, looking to the northwest; Silent Lake on the left, with the meadows(Soil Line S2), and the grass slopes underlain by shales "F", "D" and "B" in the front. The main anticlinal axis can be seen just left of the saddle on the far right.

Line S3 was across the low meadows downslope of Silent Lake, and produced one spectacular zinc anomaly in a single sample.

Line S4 was a contour traverse downslope of the "B" shale which is exposed in a series of cliffs supported at the top by the resistant "C" grit. A collection of relatively weak anomalies, usually in either Pb or Zn are scattered either side of a single station Class 1 anomaly. These may be within the "A" shale beneath the upper "A" grit and indicate an area for prospecting, and possibly a small grid.

Lines S5 and S6 are further upslope from S4 at the top of the ledge formed by the "C" grit. The southern part of line S5 is mostly on the "D" shale, and downslope of the "F" shale, whereas the northern part and Line S6 crosses the axis of the anticline, within a down-dropped block of units "A" and "B". A series of anomalies, strongest in lead, extends along Line S5 on the "D" shale, and may only reflect an elevated background in this unit. However there is something of a cluster in two separate areas (samples 024, and 033 to 040) with Class 1 and Class 2 anomalies that are worthy of follow-up prospecting and local grids extending upslope to the top of the "D" shale.

Line P13 extends along the new road on the east side of McMurdo Creek, almost to the Crown Point Cabins in the south, and to where the road crosses onto the west side of the Creek in the north. It crosses gradually from the "B" shale into the "G" grit in an area of no or poor outcrop. There were no anomalies.

9.4 Crown Point Cabins Grid

This area is on the 1983 Silent Lake sheet, and the 1982 Silent Lake and Crown Point sheets. Five lines were sampled in this area (P7 to 11) in 1982 which indicated a soil anomaly in Pb and Zn corresponding with a stratigraphically low shale unit with carbonate, and which returned anomalous results in rock-chip sampling. This unit is exposed in the tributary of McMurdo Creek that drains the Crown Point adits, and the anomaly could therefore have been entirely secondary from the Crown Point mineralization. The 1982 individual samples were analysed separately prior to the field season, and confirmed the anomaly. The grid was extended and filled in, with four additional lines near the cabins and one line either side of 1982 line P10. Though the anomaly was extended (Table 9) it is strongest, and widest near the cabins where there is a flat, flood plain, as well as a broken core-storage facility which could be contributing contamination. The remainder of the anomaly is within the upper alluvial terrace into which the present incised stream is cut, and could be due to spring flood contamination from the adits upstream. There was no soil coverage on the south-west end of the IP line in this area with its highly anomalous result. One strong anomaly in four samples remains at the southwest end of line 10. This line could not be recovered in the field, but it is thought not to end in McMurdo Creek, but rather in the head of a discrete subsidiary drainage where natural contamination would have been impossible.

TABLE 9

SOIL GEOCHEMISTRY-SUMMARY
CROWN-POINT CABINS GRID

SUMMARY STATISTICS

Pb/Zn	n	Truncated at	$\bar{x}$	s	$\bar{x}+2s$	$\bar{x}+3s$	Poss.	Prob.
Pb	92	< 60	26.93	14.67	56.28	70.95	60	70
Zn	77	>30 <120*	76.42	22.33	121.08	143.41	110	135

* data truncated to remove population with very low results, otherwise standard deviation (co-efficient of variation) unacceptable.

ANOMALIES BY PRIORITY

LINE	SAMPLE NUMBER	NUMBER OF ANOMALOUS SAMPLES	ppm Pb	ppm Zn	ppm Ag	CO-EFFICIENT SCORES	TOTAL CO-EFFICIENT SCORE
2 PROBABLE ANOMALY IN Pb OR Zn, POSSIBLE IN OTHER							
10+25N	0787	8	318	132	.9	Up to 22.3	57.9
4+50N	0729	4	163	110	.3	Up to 10.8	26.3
P9	1453	1	75	120	-	5.2	5.2
3 PROBABLE ANOMALY IN Pb OR Zn							
P-10	1515	4	10	350	-	Up to 11.1	14.9
10+25N	0792	3	74	99	.2	3.9, 4.2, 4.2	12.3
16+00N	0812	3	70	111	.3	3.5, 3.1, 4.5	11.1
P-7	1404	1	180	80	-	10.6	10.6
P-9	1445	2	85	80	-	4.1, 3.6	7.7
4+50N	0725	1	75	66	1.5	2.8	2.8
5 POSSIBLE ANOMALY IN Pb OR Zn							
6+25N	0750	2	61	96	.1	3.1, 3.2	6.3
8+25N	0769	1	68	86	.4	3.2	3.2
10+25N	0798	1	61	51	.5	1.2	1.2

Being near the road, man-made contamination remains a possibility. This anomaly deserves further follow-up with a small-grid, as lines 16+00N and P-13-C did not extend far enough to cover this area, and were too far apart.

9.5 Malachite Creek Sheet

Two long lines and a series of shorter lines were extended on either side of Malachite Creek to further test the anomalies indicated from the 1982 sampling (Dwg. DEB-83-3). These lines, mostly along contours, cross the major fold and thereby sample most of the exposed units (Table 10).

Line C5 was re-analysed and returned probable Pb anomalies over the "D" shale.

Line C6 was re-analysed and returned probable Pb with possible Zn anomalies over the "D" shale.

Line C10 extended 1982 line C5 further to the southwest to cover units "E" and "F" and downslope of exposures of carbonate in unit "F" on Carbonate Mountain. There was one possible anomaly in zinc at the far southwest end of the line, corresponding to the upper contact of the "F" shale. This line should be extended further southwest to cover the contact.

SOIL GEOCHEMISTRY - MALACHITE CREEK

TABLE 10

ANOMALIES LISTED BY PRIORITY

(Total Co-efficient Score)

LINE	PEAK SAMPLE NUMBER	NUMBER OF ANOMALOUS SAMPLES (all classes)	ANALYSIS-PEAK SAMPLE (ppm) Pb	Zn	Ag	CO-EFFICIENT SCORES *** (individual samples)	TOTAL CO-EFFICIENT SCORE ***
CLASS 1 : PROBABLE ANOMALIES IN BOTH LEAD AND ZINC							
M1(1982)	1263	16	625	1350	-	Up to 102.0	467.3
M3	1077	1	890	1090	4.4	112.1	112.1
M3	1081	9	50	920	.8	Up to 37.5	102.4
M3	1057	2	650	510	2.9	68.1, 20.3	88.4
M3	1047	3	60	660	.1	27.2, 15.3, 6.2	48.6
M2(1982)	0977	7	75	150	-	Up to 8.18	37.5
M3	1051	2	180	125	.7	13.9, 5.6	19.6
M4	1038	3	71	164	.3	3.6, 6.9, 5.8	16.2
M4	1034	2	98	146	n.d.	8.2, 4.6	12.9
CLASS 2 : PROBABLE ANOMALY IN EITHER Pb OR Zn, POSSIBLE IN OTHER							
C5(1982)	1142	5	70	110	-	Up to 21.18	38.5
C6(1982)	1217	2	70	120	-	4.5, 4.9	9.6
M4	1032	1	82	116	.6	5.7	5.7

*** See text for definition

SOIL GEOCHEMISTRY - MALACHITE CREEK

TABLE 10 cont'd

ANOMALIES LISTED BY PRIORITY

(Total Co-efficient Score)

LINE	PEAK SAMPLE NUMBER	NUMBER OF ANOMALOUS SAMPLES (all classes)	ANALYSIS-PEAK SAMPLE (ppm) Pb	Zn	Ag	CO-EFFICIENT SCORES *** (individual samples)	TOTAL CO-EFFICIENT SCORE ***
CLASS 3 : PROBABLE ANOMALY IN EITHER Pb OR Zn							
M1	1005	5	102	104	.3	Up to 6.77	23.0
C12	1114	4	106	104	.4	7.1, 5.5, 4.8, 5.0	22.3
C11	1197	3	98	103	.2	5.4, 6.4, 3.5	15.3
C11	1207	3	90	101	.4	3.8, 4.3, 5.7	13.9
M2(1982)	0975	2	35	350	-	11.9, 0.8	12.8
M3	1090	1	180	29	1.3	9.8	9.8
C11	1214	2	66	105	n.d.	3.9, 3.8	7.7
M2(1982)	0985	2	85	85	-	2.8, 4.6	7.4
M3	1075	1	107	101	.9	7.0	7.0
C5(1982)	1133	1	125	65	-	6.9	6.9
C11	1210	1	88	114	.2	6.1	6.1
C11	1182	1	86	94	.4	5.1	5.1
C11	1212	1	80	104	.4	5.0	5.0
C11	1192	1	73	111	.5	4.7	4.7
M4	1025	1	92	75	.4	4.7	4.7
M4	1021	1	85	79	.4	4.3	4.3
C11	1224	1	84	81	.4	4.3	4.3
C6(1982)	1221	1	75	85	-	3.8	3.8
M3	1096	1	78	56	.5	2.8	2.8
CLASS 4 : POSSIBLE ANOMALIES IN BOTH Pb AND Zn							
M1(1982)	1258	1	65	120	-	4.5	4.5
C12	1120	1	65	116	.2	4.3	4.3
C11	1229	1	62	114	.6	4.0	4.0
CLASS 5 : POSSIBLE ANOMALIES IN EITHER Pb OR Zn							
C6(1982)	1213	2	65	85	-	2.1, 3.0	5.1
C5(1982)	1152	2	50	120	-	3.3, 1.7	5.0
C10	1155	1	54	124	.4	3.8	3.8
C11	1203	1	46	125	.1	3.2	3.2
C11	1166	1	62	76	.5	2.4	2.4

Line C11 covered the entire anticline, from units "G" to "C", and back to "G". A series of probable Pb anomalies and possible Zn anomalies, (1196-1210) plot within the "C" grit, but downslope of the "D" shale, and within the "D" shale on both sides of the anticline. There is a single station Pb anomaly (1224) corresponding to the "F" carbonate on the east limb of the anticline, but no anomalies on the west limb.

Line C12 is at the base of Carbonate Mountain, above the bank of Malachite Creek, and downslope of the projected position of the "B" shale where it should be sub-overburden in the core of the anticline in the valley floor. A four-sample probable Pb anomaly (1114) was located.

Line Carbonate IP #9 was sampled at 10 metre intervals to correspond with the IP data covering the anticline and the "F" and "D" shales. The only anomalies were single station, single element, with the only probable Pb anomaly being in the "E" shales.

Line M1 from 1982 was extended southwest at 10 metre intervals to cover the ridge with the Malachite Adit showing, approximately 50 metres above the showing. There is a coincident probable anomaly in 4 samples in the "F" shale above the stratigraphic level of the known zinc mineralization, but no anomaly over the position of the host shales and carbonates. This line may have been reversed in the field, and should be checked. If correct then this is a new anomaly worth following up.

Line M4 was sampled immediately above the Adit and through the position of drill-holes DEB-83-10 and 11. A probable Pb anomaly on one station corresponds stratigraphically with that on line M4. Probable Pb and Zn anomalies (Class 1) with additional adjacent, weak anomalies correspond with the position of the adit and the carbonates.

Line M3 was a long line extending from below the Adit showing and across the slopes below the Malachite Detail area, but above 1982 line M2 on which a number of anomalies had been located and confirmed in the individual sample analyses. The 1982 anomalies were considered at the time to have probably been derived from veins within quartzite bluffs. This higher line was intended to indicate any possible train towards their actual source. From west to east it indicated anomalies beneath the Adit, particularly in zinc, and downslope from the strong 1982 anomaly on line M1 derived from the Malachite Ridge showing and its resulting scree slope and mineralized-boulder train. Strong probable anomalies in both Pb and Zn were located above those on line M2. Together with those on lines C11, and C12 these anomalies indicate a strong, broad anomalous belt that is too widespread to be simply due to isolated quartz veins in the grits. Considerable further prospecting and an extension of the detailed mapping is recommended for these slopes, but such will probably be difficult. Little further geochemistry is possible because of the absence of suitable sampling levels and meadows, the rest of the slopes being mostly scree and boulder fields. This is certainly now one of the strongest anomalies on the property, and remains unexplained.

9.6 Stream Sediment Geochemistry

A total of 27 stream-sediment samples were analyzed, all from the Silent Lake area where appropriate drainages were crossed by soil-lines. These indicate a number of anomalies (Table 11), generally corresponding with the areas of anomalous soils.

TABLE 11

STREAM SEDIMENT SAMPLES

(COLLECTED ON SOIL LINES)

Soil Line	Sample Number	Description of Sample	Pb (ppm)	Zn (ppm)	Ag (ppm)	Comments
S-2	0501	Silt	39	113	.3	
S-2	0502	Silt	i.s.	i.s.	i.s.	Insufficient sample
S-2	0503	Gravel	49	148	.2	Probable Zn anomaly
S-2	0504	Silt/Gravel	40	140	.4	Probable Zn anomaly
S-2	0505	Silt/Gravel	46	118	.3	
S-2	0506	Silt/Gravel	49	134	.1	Possible Zn anomaly
S-2	0507	Silt	55	124	.8	Possible Zn anomaly
S-2	0508	Silt/Gravel	34	110	.1	
S-2	0509	Silt	37	127	.4	Possible Zn anomaly
S-2	0510	Silt	38	102	.1	
S-3	0319	Silt	59	92	.2	
S-3	0320	Silt	48	102	n.d.	
S-4	0101	Silt/Gravel	56	128	.5	Possible Zn anomaly
S-4	0102	Silt/Gravel	42	112	.3	
S-4	0103	Silt/(organics)	34	98	.8	
S-4	0104	Silt	32	108	.3	
S-4	0105	Silt/Gravel	37	98	.2	
S-4	0106	Silt	23	92	.1	
S-4	0107	Silt/(organics)	21	80	.2	
S-4	0108	Silt	32	94	.2	
S-4	0109	Silt/Gravel	37	89	.2	
S-4	0110	Silt	23	104	.1	
S-5	0001	Sand	74	106	.4	Probable Pb anomaly
S-5	0002	Silt	58	103	.4	
S-5	0003	Silt	50	94	.1	
S-5	0004	Sandy-Silt	72	110	.2	Probable Pb anomaly
S-6	0400	Silt	75	72	.6	Probable Pb anomaly
S-6	0500	Sand/Gravel	39	106	.4	

	Pb	Zn
n	27	27
$\bar{x}$	44.30	107.56
s	14.56	17.68
$\bar{x}$ + s	58.86	125.24
$\bar{x}$ + 2s	73.42	142.92
x + 3S	87.98	160.60

	Pb	Zn
∠ (truncated at)	60	119
n	24	21
$\bar{x}$	40.63	100.14
$\bar{x}$ + s	10.62	11.22
$\bar{x}$ + 2s	51.25	111.36
$\bar{x}$ + 3s	61.87	122.58
	72.49	133.80

		Pb	Zn
possible anomaly	>	60	120
probable anomaly	>	70	135

10. GEOPHYSICAL, IP AND RESISTIVITY SURVEY

10.1 INTRODUCTION

In August 1983, an induced polarization and resistivity survey was carried out as part of an integrated geophysical, geochemical and geological program on the DEB Claims, Golden Mining Division, British Columbia. The survey was initiated to aid in evaluating the true dimensions of several showings of Pb-Zn sulphides and to locate other buried mineralization in the Malachite Creek area.

An additional objective of the survey was the provision of reconnaissance mapping information capable of establishing the depth, thickness and approximate mineral content of several favourable litho-stratigraphic horizons, particularly in the Carbonate Mountain and Crown Point areas.

Survey work was generally restricted to areas above tree line except the single traverse in the Crown Point area where well-forested lowland and alpine meadow occur in an area of severe relief. The field operations phase, initiated August 3rd, was successfully completed by Phoenix Geophysics Limited on August 16th. Samim Canada Ltd. personnel provided direct field supervision and assisted as part of the field crew during all operations.

As a result of this overall program and other past efforts the nature and economic mineral potential of this complex black-shale basin has been better recognized. Suitable exploration equipment, techniques and personnel have also been tested and proven effective for any future exploration activities on the DEB Claims.

10.2 SURVEY PROCEDURES

10.2.1 Geophysical Grids

Eight control lines were placed in three survey areas in advance of the reconnaissance phase of surveying. Placed by geological crews employed by Samim Canada Ltd. these grid lines were oriented in approximately a northeast direction to ensure that geophysical coverage would cross the regional geologic strike direction at right angles. Line length was determined equally by topographic restrictions and the extent of favourable host stratigraphy in each area.

In the Malachite Creek area, a five line grid was established. Bearing 040° azimuth from a prominent showing near 7+00E; line 10+00N was established by chain and compass methods extending down slope to a small plateau at an elevation of 2265 metres (see orthophoto relief map - Pacific Survey Corp. 83-74). From this point, designated baseline 10+00N, line 10+00E the main control line, was extended towards the north on a true bearing of 310°. Grid lines 7+50N, 10+00N, 13+00N, 16+00N and 19+50N were established perpendicular to this baseline at an approximate interval of 300 metres using a four point turning board. During the latter stages of reconnaissance surveying in this area a secondary control line was established from station 6+00E line 10+00N to line 13+00N near 6+00E. Infill line 11+50N was turned off bearing 040° from this secondary control line to permit detail traverses over an anomalous zone. On all reconnaissance lines, pickets were placed at a slope chained interval of 25 metres. For detail purposes, parts of line 10+00N and 13+00N were rechained and infill line 11+50N was chained at 10 metre intervals using a slope adjustment procedure.

IP line 19+50N crosses the boulders to the highest trees; Horseman (left) and Malachite Spires in the distance, at the head of Malachite Creek.

Malachite Detail, IP survey crew on line 13+00N.

In the Carbonate Mountain area two traverse lines separated approximately 300 metres apart were placed to be approximately coincident with geochemical sampling traverses completed in 1982. Minor adjustments in orientation were made because of severe topography or geological constraints but in general a line orientation of 040° azimuth was maintained. Pickets were placed at intervals of 25 metres along these survey lines starting from the landing lake on line 10+00N. No tie lines or chained control lines were placed in this area as control was established from topographic contours on a 1:5,000 orthophoto mosaic prepared by Pacific Survey Corporation, under contract arrangements.

In the Silent Lake area a single traverse line was cut in wooded terrain. Starting near a prominent stream geochemical anomaly this line was established on a bearing of 036° azimuth by chain and compass techniques. Designated line 7+25N this line was cut westward from an old access road to the northern boundary of the Crown Point Crown Grants (station 7+25E) and eastward along a severe west facing slope to an alpine meadow at chainage point 22+50E. Near this eastern extremity a suitable helicopter landing area is located.

Location of these grid lines relative to the claims, showings, roads and prominent topographical features are indicated on the accompanying maps.

In total 2.25 kilometres of control lines and 8.20 kilometres of survey lines were prepared by Samim Canada Ltd. personnel.

10.2.2 Induced Polarization and Resistivity Survey

A Phoenix model IPV-1 IP and Resistivity receiver was used for this work with a Phoenix model IPT-1 transmitter powered by a 1.0 Kw motor generator. A manufacturer's brochure outlining equipment specifications is provided in Appendix H.

The dipole-dipole array was employed in all measurements as past experience with this array and its symmetrical configuration were felt to be advantageous from a cost-effectiveness standpoint while providing good resolution of the lateral resistivity variations which occur in this geologic environment. During the reconnaissance phase the basic interelectrode distance was 50 metres. Detailed surveying was also completed using 10 metre dipole lengths. Six dipole separations were recorded in every case.

The IP effect, a measurement of the polarization effect of all electronic conducting minerals in the rock mass, was recorded directly from the receiver unit as Percent Frequency Effect (P.F.E.). This parameter, a measure of the change in resistivity of the system as a whole with variations in the frequency of the current generating system, was observed at operating frequencies of 4.0 Hz and 0.25 Hz.

The observed voltages at the receiver station were also reduced to the conventional apparent resistivity parameter and normalized to units of ohm-metres by the following equation:

$$\text{Rho} = K\, V/I$$

where Rho is the apparent resistivity in ohm-metres
V is the observed voltage at the receiver in volts
I is the transmitter output current in amperes
and K is a composite constant combining a geometrical factor for the electrode configuration and a conversion factor to derive ohm-metre units from a metric-chained grid system.

Because the measurement of the degree of polarization or P.F.E. is related to the apparent resistivity of the rock mass the metal factor values or M.F. were calculated. These M.F. values were obtained by normalizing the P.F.E. values for varying resistivities according to the formula:

$$M.F. = \frac{(P.F.E. \times 1000)}{Rho}$$

Throughout the survey both 24 inch steel spikes and sheets of aluminum foil in shallow trenches were employed to provide acceptable electrode resistance values. In several instances salt water solution containing 1 Kg of coarse grained salt to 5 gallons of water was also added to both electrode materials to make the ground electrolyte at these current electrodes more conductive. This activity was found to be particularly necessary in the Malachite Creek area in zones of frozen ground and within a zone of dry esker gravels estimated to be in excess of 10 metres thickness.

The receiver system routinely employed two plastic "porous-pot" electrodes containing an unglazed ceramic bottom part and a copper sulphate electrolyte. In several instances when received voltages tended to be "noisy" the receiver operator employed the previously placed steel spikes as measurement electrodes. In all cases contact resistance was maintained at a level which provided sufficient current flow between electrodes and noise free data.

In total 7.67 line kilometres of survey were completed with 2122 readings taken and 254 stations occupied between August 3rd and August 16th. A list of the personnel employed during this survey is attached as Appendix G & L.

10.3 PRESENTATION OF RESULTS

The values of apparent Resistivity, apparent Percent Frequency Effect and the apparent Metal Factor measured for each set of electrode positions were plotted as separate pseudosections and as composite cross-sections.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of the vertical changes in the properties. For presentation purposes the conventional pseudosection is employed in a similar yet diagrammatic manner. These pseudosections are prepared by plotting the results at the intersections of a set of grid lines sloping at 45 degrees below a horizontal representation of the ground surface. Each line in this plotting grid originates at either the center point of the current electrodes or the potential electrodes with the observations recorded at the respective intersection points.

An interpretation was made from these preliminary pseudo-sections with the interpreted location of polarizable bodies indicated by bars. These plots were retained by personnel of Samim Canada Ltd. at Golden. The data was subsequently shipped to the Vancouver facilities of Phoenix Geophysics Ltd. on conclusion of the survey.

In Vancouver, the data were manually entered into a Hewlett Packard HP-85 computer where software routines proprietary to Phoenix Geophysics were applied to post, edit and recalculate all field measurements within the limitations of the engineering graphics capabilities of the Phoenix HP-85 system. A series of revised pseudosection plots were contoured and printed. Taped laydowns of the Resistivity, P.F.E., and Metal Factor pseudosections were prepared and labelled for each line surveyed and each dipole separation used. Machine reproduced versions of these composite pseudosection plots were included with a summary report forwarded to Samim Canada Ltd. in October (P.A. Cartwright, 1983). Copies of these composite pseudosections are attached as Dwgs. IP-5833-1 to IP-5833-11.

In Toronto, the computerized data were verified against the field-prepared pseudosections by Samim Canada Ltd. staff to detect errors and omissions and permit a revision of the interpreted locations of any polarizable bodies. No significant omissions were detected and these data were then posted to composite cross-sections.

Cross-section presentations of these results were prepared to provide reconnaissance mapping information which would permit more reliable projections of the depth, thickness and approximate mineral content of several favourable litho-stratigraphic horizons which outcrop in the Malachite Creek and Carbonate Mountain areas. Such cross-section presentation techniques were not prepared for the Crown Point area.

In preparing these cross-section diagrams the conventional pseudosection plots were modified to display the effect of topographic irregularities on the results. The results however, have not been adjusted or filtered to reflect such topographic effects in a numerical sense.

To plot any revised data point in these topographically adjusted sections, the lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value below this sloped line joining the center points is determined by the distance between the nearest current and potential electrodes (na) when the measurement was made. The revised data point is established by drawing intersecting arcs originating at the center point between each current and potential electrode pair from which the measurement originated. The fixed radius for such arcs for any inter-electrode interval is given in the formula:

$$r = \sqrt{2} \left(\frac{n+1}{2} \right) aS$$

where r is the map length of the radius vector

n is an integer number

a is the dipole length or the linear distance between two points on the ground through which either current is applied or potential is measured

S is the scale factor of the cross-section

The use of topographically adjusted pseudosections, when combined with experience gained from other field results, provides a better comprehension of the geologic significance of the IP data. However, the separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. Therefore it must be recognized that such pseudosection representations are not true section maps of the electrical properties of the ground below the survey line.

10.3.1 Malachite Detail Area

The reconnaissance Metal Factor and P.F.E. values are presented on two stacked cross-sections at a scale of 1:2,500. All data locations have been topographically adjusted and all geological observations have been provided for correlation purposes. The pseudosections exhibit no vertical exaggeration. Metal Factor values are contoured at a logarithmic interval while P.F.E. values are contoured using a linear interval of 1.5%. It should be noted that the actual contours drawn on the P.F.E. sections reflect a statistical analysis of the data in order to permit grouping of the observations into classes interpreted to have homogeneous "pseudoelectric" properties termed "background", "transitional" and "anomalous". A highly qualitative estimate of the "pyrite equivalent" content within such statistical classes, displayed as stipled areas on the cross-section, is also provided in the legend as are the population statistics.

On the Metal Factor cross-section, stipled patternings have been used to reflect population statistics and areas where detail coverage is available (10 metre dipole separation) have been prominently outlined.

The data from the 10 metre detail traverses have not been presented in any topographically adjusted format. Such data were taken only to improve source resolution through increased samplings in specific areas identified from the reconnaissance phase. To interpret such detail areas one must be prepared to rely extensively on the use of experience gained from past field results (a case history approach), model study results and available theoretical investigations.

10.3.2 Carbonate Mountain Area

All Metal Factor and P.F.E. values are presented on two stacked cross-sections at a scale of 1:2,500. Similar to those adjustments made to data locations for the Malachite Detail Area, these data have been presented as topographically adjusted pseudosections with all geological observations provided for correlation.

Metal Factor values are contoured at a logarithmic interval. Areas where values exceed 5.0 or where values are less than 2.0 are highlighted by a stipled pattern to reflect possible population statistics as discussed above (see section 10.3.1).

P.F.E. values are contoured using a linear interval of 1.5%. As with the data from the Malachite Detail Area both contours and patterned areas have been presented to reflect the population statistics of all measurements and provide for line to line correlations through the use of general pattern recognition. Numeric information on the specifics of the population and a qualitative estimate of the "pyrite equivalent" content within defined zones is provided in the legend which accompanies these cross-section diagrams.

10.3.3 Crown Point Cabins Area - Silent Lake

The reconnaissance Metal Factor and P.F.E. values are presented as prepared by Phoenix Geophysics Ltd. All data has been contoured logarithmically and recognizable IP anomalies have been indicated on the top of this section. Indicated as solid and dashed bars these symbols represent the surface projection of interpreted definite and less definite anomalies, respectively.

All bar representations of the interpreted Metal Factor anomalies for all three survey areas have been transferred to two topographic base maps for correlation purposes. These plan presentation maps are identified as Dwg. DEB-83-2 and Dwg. DEB-83-10.

10.4 DISCUSSION OF RESULTS

Reconnaissance traverse results from three different areas on the DEB claims record that the apparent Percent Frequency Effects (P.F.E.) observed vary from near zero (0.5 percent) to a high of 8.9%. Background for this parameter throughout all areas is generally less than 4.0%. This "high" background number indicates that most lithologies contain some "pyrite equivalent" content.

The effect of the generally complex resistivity contrasts is best identified in the normalized Metal Factor (MF) parameter. This parameter varies from a near zero value (0.3) to a high of 73 at the western end of the Crown Point line. Background M.F. was statistically determined as 3.3 ± 0.8 throughout the Malachite Detail area. This value is considered typical for all other survey areas. The larger dynamic range for the M.F. parameter relative to the P.F.E. value indicates that there is greater variability in the resistivities. It is suggested that this is caused by the prominent jointing and fracturing patterns observed in some zones. The resistivities throughout all areas vary from a high of 6562 ohm metres to a low of 95 ohm metres, with background resistivity generally varying between 1300 ohm metres and 2000 ohm metres.

For interpretive purposes it is therefore inferred that the resistivity parameter calculated from a 50 metre dipole interval, while substantiating the complexity of the electrical environment, remains ambiguous for geological mapping purposes. Correlation attempts aided by the use of enhancement techniques such as statistical pattern recognition or data inversion routines proved equally less than satisfactory in resolving such complex geology.

To establish the relative "anomaly threshold" for all of the data, three traverses were completed using a 10 metre dipole interval. This area on the Malachite grid, previously explored using a 50 metre dipole interval, is known to contain several showings of Pb, Zn and Ag mineralization. All traverse results provided improved resolution with good correlation demonstrated between an area of lower resistivities, higher P.F.E.'s, higher M.F.'s and a zone of alteration within the shales with enhanced pyrite content. This "target zone" is exposed on one limb of the major anticline throughout the Malachite Detail area, as well as at Carbonate Mountain and appears to be coincident with altered, carbonaceous shales and limestones containing up to 20% siderite and abundant pyrite in units "D" and "F". The strongest anomalies at Malachite Creek appear to coincide with the surface expression of the carbonate unit at the top of the unit "D shale". Assays exceeding 16% Pb, 16% Zn and 15 oz/ton Ag over narrow widths (18 cm) were recorded from drill hole DEB-83-6 within this 10 metre to 15 metre wide "target zone".

The results from each grid area are discussed separately below.

10.4.1 Malachite Detail Area

Two major anomalous trends are interpreted in the reconnaissance 50 metre dipole data recorded over this grid as presented in Dwg. DEB-83-10. Details of specific anomalies identified along these trends are more clearly presented in Dwg. DEB-83-6 and Dwg. DEB-83-7. The most anomalous zone designated the "AB" Trend extends from line

7+50N through line 16+00N. It coincides with the Malachite trenches, and can be projected through the Malachite Ridge showing to the Malachite Adit zone where an end-of-line anomaly on line 19+50N is located (see Dwg. DEB-83-10). The complex patterns identified within this anomalous trend suggest the presence of multiple IP sources contained within a restricted width equivalent to or less than the dipole interval used, i.e. 50 metres.

To provide improved resolution of these complex anomaly patterns a section of the "AB" Trend was resurveyed with a 10 metre dipole array. The data obtained (Dwgs. IP-5833-3, 5, 6) distinctly outlines a very narrow (less than 10 metres wide), very shallow and conductive source coincident with known Pb-Zn-Ag mineralization in the unit "D" carbonate. From drill results, pyrite content within this zone (Zone "A") shows a significant volume increase. P.F.E. readings confirm this phenomena as those associated with the zone are the highest values recorded by the survey.

The presence of a similar target (Zone "B") has also been identified in the 10 metre data. Interpreted by Cartwright (1983) to occur 35 metres southwest of and parallel to Zone "A", this target is believed to represent a buried source with the minimum depth-to-top being 20 metres subsurface (approximate).

A third, much less anomalous zone on the 10 metre data, designated Zone "C" by Cartwright is primarily marked by lower than "local" background apparent resistivity values. It is considered too intermittent a trend to warrent much ongoing interest. However, two isolated anomalies along this proposed zone may warrant further consideration. These include an area characterized by quite high P.F.E. values located grid west from 5+70E on line 13+00N in an area typified by higher than background resistivities. Even more pronounced, in the Metal Factor parameter, is an anomaly centered at 5+75E on line 10+00N. The proximity of this latter anomaly to the "SR" Pb-Zn-Ag showing located at grid co-ordinates 5+30E and 8+30N, provides encouragement for follow-up. Both forward modelling and inverse modelling routines have been applied to the resistivity data observed between 5+30E and 6+10E on line 10+00N to determine a source body for the lower resistivity values centered at 5+75E, 10+00N. Coinciding with elevated P.F.E. and prominent M.F. values, model results suggest that the source is a limited zone 150 times less resistive, i.e. more conductive, than the surrounding lithologies, having a width limited to 10 metres and a limited depth extent from approximately 15 metres to 35 metres subsurface.

Also based on modelling assumptions this body would strike parallel to Zone "B" approximately 60 metres towards grid west, and have a strike extent of at least 30 metres.

The second major anomalous trend in the reconnaissance 50 metre dipole data was designated Zone "D" by Cartwright. Most anomalous on line 7+50N and line 10+00N in the vicinity of the baseline 10+00E, this zone appears only at depth on line 13+00N and 16+00N (see Dwg. DEB-83-6). A forward modelling routine applied to the pronounced low resistivity zone observed on line 7+50N has indicated that a "best fit" source would be a near vertical dipping zone 10 metres wide, extending for 100 metres below a subsurface depth to top of 6.25 metres. This anomalous source appears characteristically to be 30 times as conductive as the surrounding "host" rocks and is centered at 9+75E on line 7+50N. Such a source could, quite plausibly, be associated with the major area of faulting separating the "F" shale from the "G" grit units as mapped. A pyritic gossan has also been identified at this locale.

A most important consideration in assessing Zone "D" may not be the actual nature of the source of lower resistivities but the elevated P.F.E. values observed only at depth to be associated with this anomaly. An exploration drill hole to a depth in excess of 150 metres appears to be an appropriate strategy to test the significance of this complexly anomalous zone prior to further exploration along the trend, even though this feature is less anomalous than the 50 metre response seen over the known mineralization.

10.4.2 Carbonate Mountain Area

The results from the two reconnaissance lines surveyed with 50 metre dipoles are presented as Dwg. DEB-83-7 and Dwg. DEB-83-8. Four anomalous zones (definite and probable categories) have been interpreted within a broad area of generally high P.F.E. values. All anomalies have M.F. and P.F.E. features which resemble very closely the anomalies recorded on the 50 metre data in the vicinity of the known mineralization on the Malachite Grid. Based on this association it is probable that within this predominantly shale hosted environment relatively narrow zones occur in which enhanced pyrite and probable Pb-Zn-Ag mineralization are present.

The most pronounced M.F. anomalous zone (Zone "A") appears to occur within the hinge area of an anticlinally folded shale sequence. Indicated to occur with a depth to top of source being less than 50 metres, the anomalous character improves with depth. The source appears to be terminated by faulting identified near 9+25E on both lines. East of this fault anomalous Zone "D" occurs. This anomaly may be an extension of the Zone "A" feature at depth. If such is the case then an east-side-down motion of 100 metres (approximate) is indicated along this axial fault trace.

Two additional anomalous IP zones (Zone "B", Zone "C") are identified to occur "up section" from anomaly "A". Both Zone "B" and Zone "C" appear to have relatively shallower sources indicated on line 10+00N than indicated on line 9+00N where these sources occur below more resistive rocks, probably the limestone or grit units indicated (see Dwg. DEB-83-8). Zone "B" may therefore be attributed to a dual source with both shallow mineralization occuring within the upper contact area of the "E_2" shale and deeper mineralization occurring within the "D" shale unit. This latter presumption would imply that the source of the "A" Zone extends to depth.

Anomalous Zone "C" appears to be associated with a contact between the "F" shale and "Fc" carbonate units as mapped on line 9+00N. However, the "C" anomaly may occur entirely within the "Fc" carbonate unit situated on line 10+00N. Located between 6+00E and 6+50E on line 10+00N, this target would be most effectively tested by drilling to a depth of intersection which exceeds 50 metres. Additional surveying and limited modelling of these results using a smaller dipole interval (20 metres or less) is required to establish more realistic target dimensions prior to any drill test of this anomaly.

10.4.3 Crown Point Cabins Area - Silent Lake

Undertaken as a one line test, line 7+25N was placed in an area of anomalous soil geochemical results from the 1982 sampling. With such extremely rugged relief and limited accessibility for operational purposes it is not surprising that only a limited amount of data were recorded. This data does, however, exhibit some of the most anomalous results seen in the entire survey (see Dwg. IP-5833-11). Varying from values of 73 to 0.3 the M.F. parameter shows a highly anomalous character particularly to the west of station 8+25E. This anomaly coincides with an increase in the P.F.E. parameter to values which exceed a four-fold increase above background numbers. The source of this prominent anomaly remains incompletely defined but is inferred to be a conductive target zone extending from 7+50E to 8+25E and may be associated with faulting located on the Crown Point Crown Grants (see Dwg. DEB-83-2).

A second anomaly, though much less anomalous, is located between 10+25E and 11+25E on line 7+25N. This target corresponds with a soil geochemistry anomaly reported from the 1982 MineQuest program. It is most recognizable as a feature in the Metal Factor values and appears to be associated with a lithological contact with more resistive units east from 11+50E and less resistive shales towards grid west.

10.5 CONCLUSIONS

10.5.1 High grades of Pb, Zn, Ag mineralization occurring over narrow widths which have been located in this area of Upper Precambrian black-shales, have been directly detected through the use of the IP method.

10.5.2 Statistical analysis, when applied to the conventional pseudosection plots so as to determine zones having homogeneous "pseudoelectric" properties, provides a useful aid to mapping. This technique when combined with the extensive geologic information available on the DEB Claims gives a qualitative estimate of the position, depth and structure of the various lithostratigraphic units to within a spatial resolution consistent with the electrode interval used.

10.5.3 For the three areas surveyed, several of the complex anomalous zones identified during reconnaissance traversing remain permissable areas in which to develop an economic stratabound Pb, Zn, Ag deposit. Where such anomalies are interpreted to be near-surface, geochemical results should be reviewed to establish priority target locales. However, deeper IP anomalies remain permissive targets in the absence of anomalous geochemical results.

In the Malachite Detail Area it is also concluded that:

10.5.4 Additional IP traverses should be completed on the "AB" trend and along the "C" zone to improve the estimation of source parameters, and the overall nature and strike extent of the massive "SR" showing Pb-Ag mineralization;

10.5.5 Further definition of the "D" anomaly would require a drill test of approximately 200 metres. Such drilling would help to clarify the geologic environment in the vicinity of the major fault zone coincident with this anomaly and would also establish the nature of the mineral concentration interpreted to exist below 50 metres subsurface.

In the Carbonate Mountain Area it is also concluded that:

10.5.6 The identified IP zones occur within the same lithostratigraphic units which host the known Pb, Zn, Ag mineralization on the Malachite Detail Grid;

10.5.7 The available geophysical data remain insufficient to effectively define source dimensions and locations as direct target criteria for drilling purposes, even though the "A" zone is one of the most anomalous IP features detected by this survey.

In the Crown Point Cabins Area it is also concluded that:

10.5.8 The major anomaly centered near 7+50E, line 7+25N remains incompletely defined making additional IP coverage necessary prior to completing any further exploration on this target.

10.6 RECOMMENDATIONS

10.6.1 Detailed IP work, using shorter dipole lengths, is recommended to further evaluate the existing zones before drill testing is considered.

For ongoing exploration in the Malachite Detail Area it is recommended that:

10.6.2 A six line grid be placed to provide additional coverage of the "AB" Trend and the "C" zone. Using a 100 metre line separation this grid would be centered on the "AB" Trend between line 10+00N and line 13+00N and extend westwards to cover the "C" zone and the "SR" showing. Line length would be sufficient to ensure complete data to n=6 using the dipole-dipole IP method with a 20 metre electrode interval;

10.6.3 The VLF-EM or equivalent fixed source EM technique should be tested over these targets to assess the usefulness of such methods as viable alternatives to IP in resolving narrow, near surface features;

10.6.4 A 200 metre drill test of anomaly "D" should be completed with the drill collar to be placed on line 7+50N in collaboration with staff geologists.

For ongoing exploration in the Carbonate Mountain Area it is recommended that:

10.6.5 Two separate three line grids be established to permit further detailed IP work centered on the "C" zone at line 9+00N and on the "A" zone at line 10+00N. This limited IP "set-up" work would proceed using a 10 metre dipole interval to define target parameters on the "C" zone and both 10 metre and 20 metre dipoles to resolve source dimensions for the "A" zone. All IP "set-ups" would be spaced at a nominal line interval of 100 metres or less, dependant only upon topographic restrictions.

10.6.6 A minimum drilling program of 150 metres should be undertaken to test the reliability of the interpretive procedures used to define direct target criteria for the "A" zone. Dependant on these results additional drilling may be warrented to test the "C" zone.

For ongoing exploration in the Crown Point Cabins Area it is recommended that:

10.6.7 A full evaluation of the significance of the 7+50E, 7+25N target be completed;

10.6.8 The detail IP survey would be completed on three lines separated 100 metres apart and that the dipole-dipole array be employed with a 10 metre electrode separation;

10.6.9 A minimum 2 hole drill program of 200 metres (approximate) would proceed as a necessary part of the above evaluation;

10.6.10 Further reconnaissance IP surveys in the Silent Lake area should be planned conditionally, to provide further exploration data over all geochemically anomalous zones.

REFERENCES

1) G.J. Dickie and R.V. Longe, 1982; DEB Project
Geology and Geochemistry of the DEB Claims, internal report to Samim Canada Ltd. by MINEQUEST Exploration Associates Ltd., October 1982.

2) Paul A. Cartwright, 1983; Phoenix Geophysics Limited Report on the Induced Polarization and Resistivity Survey of the DEB Claims, Golden Mining Division, British Columbia, October 31st, 1983.

3) Pacific Survey Corporation, Project 83-74. Also Dwg. DEB-83-4.

11. ROCK SAMPLING

During the mapping a total of 21 rock-samples were collected and subsequently analysed to check for mineralization (Appendix F, Form 8). The samples are shown on maps Dwg. DEB-83-2, 3 and 4. Though a number of samples were anomalous, particularly in lead in carbonates at Silent Lake (G-SR-4-3, G-TB-4-1), none produced results of sufficient significance to suggest mineralization worthy of immediate follow-up.

The rock samples taken in the Crown Point cabins area, taken in exactly the same place as in 1982 were not at all anomalous, further downgrading this target area.

The 1982 rock-chip samples were studied statistically and the results are given in Appendix A.

During the mapping one new showing, the "SR" showing was located and sampled. Originally observed in 1981 and 1982 it was described as a vein from the limited exposure available. However the greater snow-melt in 1983 allowed for greater exposure of massive galena. This was subsequently hand-trenched and sampled (Appendix F, Form 4) and a chip sample taken over the enclosing shales. (Appendix F, Form 3). The mineralization was seen as massive galena, with minor pyrite and lying in a complex series of tight-folds within F shale and carbonate. Though massive it appeared to be stratabound, and occupying a small anticline. Diamond drilling (see below) subsequently demonstrated that this was part of a somewhat larger synform with the mineralization

FORM 3

Samim Canada Ltd.

ROCK CHIP SECTION SR SHOWING

MAP AREA: Malachite Detail

SAMPLED BY: M.Cook/S.Blair, measured by T.J. Bottrill/S.D. Robinson

DATES: August 16, 1983

ROCK UNIT: F shale-carbonate

GRAPHIC LOG	LITHOLOGY	MINS	SAMPLE NUMBER	WIDTH m	Results,ppm Pb	Zn	Ag	
	Interbedded siderite & black-shale		RC-16-11	1.0	20	86	n.d.	
	Shale,5-15cm grey, 1cm black	5% siderite	RC-16-10	1.0	15	124	n.d.	
	Siderite & black shale		RC-16-9	0.5	12	74	n.d.	
	Massive sulphide	Galena Pyrite Sphalerite		1.6	SEE MINERALIZED CHIP SECTION			
	Shale,qtz. stockwork	10-20% siderite	RC-16-1	0.5	23	3180	0.7	
	Grey shale, massive	10% side-erite	RC-16-2	0.4	28	620	n.d.	
	Limestone	Rusty	RC-16-3	0.7	121	670	0.1	
	Shale, crenulated	Sideritic	RC-16-4	0.9	45	2130	0.1	
	Shale, crenulated	Pyrite 20%	RC-16-5	0.9	33	379	n.d.	
	Shale, crenulated	Siderite Py 20%	RC-16-6	0.9 0.9	21	222	n.d.	
	Shale, bedded siderite	Pyritic	RC-16-7	0.9	26	650	n.d.	
	bedded shale sideritic	3-5% pyrite	RC-16-8	1.0	20	331	n.d.	

FORM 4

Samim Canada Ltd.

MINERALIZED CHIP SECTION SR SHOWING

MAP AREA Malachite Creek, Malachite Detail

LOCATION SR Showing

DESCRIPTION OF MINERAL OCCURRENCE

1.6 m x 7 m - massive sulphide-galena, some sphalerite, pyrite, fine grained silica, thin shale interbeds.

SAMPLED BY T. Bottrill/S.D. Robinson

DATE August 16th, 1983

REFER TO TEXT

ILLUSTRATION

GRAPHIC LOG	LITHOLOGY	MINERALS OBSERVED	SAMPLE NUMBER	WIDTH	Results				
					Cu %	Pb %	Zn %	Ag oz/t	Au oz/t
		Galena	G-TB-16-1	0.70m	.44	27.57	.85	42.54	.253
		Galena	G-SR-16-1	1.65m	.38	42.13	.66	47.98	.141

The SR showing at Malachite Detail; galena underlies all the gossanous material.

restricted to the smaller fold axis. The adjacent shales, particularly in the footwall are all highly anomalous in zinc. One of the altered mafic tuffs was seen immediately along strike of the showing. In general the stratigraphic position, the wall-rock mineralization, and the mafic tuff are all consistent with the other stratabound showings on the property, suggesting that this also is a true stratabound showing, but like others intersected in drilling may be a "sweat" from nearby in-situ stratiform as well stratabound mineralization on the same horizon.

12. DIAMOND DRILLING

Eleven diamond drill holes were completed for 493 metres, all in the Malachite Detail area.

12.1 S.R. Showing

Three of these tested the SR showing, but failed to intersect the massive galena mineralization. Hole DEB-83-1 intersected similar zinc-anomalous shales as those beneath the showing, and appears to be entirely in the siderite rich footwall section to the showing, with indications in the hole of the complex folding observed on surface. DEB-83-2 was drilled from the same site but with a more northerly bearing to intersect any possible plunge where the showing was thickest and appeared to be continuing into the hill. It was again within the sideritic shales, with complex folding. It was not analysed, so the possible continuity of the anomalous zinc horizon is unknown. DEB-83-3 was drilled from grid east to west, from beneath the showing and was again in the footwall sideritic shales, with complex folding. It was not analysed.

12.2 Malachite Trenches Showings and IP Anomaly

Two holes, DEB-83-4, -5, from the same set-up, with dips of -50° and -75°, were drilled beneath Trench #2 from 1982, which had returned very high results in lead, zinc and silver (4.43% Pb, 8.2% Zn, 3.9 oz/t Ag over 0.50 m) in an area of high background lead and zinc within black

Diamond drilling at the SR showing, Malachite Detail

Malachite Detail, diamond drilling at the SR showing (foreground with measuring rod).

Diamond drill move to hole DEB-83-6.

shales of unit "D". Both holes intersected a limestone, medium to coarse grained and massive, with pyrite and graphite. The upper hole (#4) contained only 30 cm of disseminated galena, which assayed only 0.13% Pb over 0.80 m, in a highly siliceous sample (69.14% SiO_2, as against 7.17% CaO). There was no mineralization in the lower hole.

Hole DEB-83-6 was sited to test a strong, near-surface IP anomaly on line 11+50 from the 10 m dipole data. It intersected the "E" grit/"D" shale contact, with the "D" shale containing limestone and the altered mafic volcanics. It intersected an 18 cm thick massive sphalerite, galena vein with a quartz-carbonate matrix (16.4% Pb, 16.7% Zn and 15.9 oz/t Ag), overlying very black shale with visible pyrite and galena which assayed 2.23% Pb, 6.09% Zn and 1.0 oz/t Ag. This immediately overlies one of the altered mafic tuffs, but was not directly within the limestone horizon. Hole DEB-83-7 was drilled as an undercut (-70°) and though it intersected the same sequence, including the altered tuff and the limestone it did not contain any obvious mineralization. However the shale immediately overlying the limestone was highly anomalous (2490 ppm Pb, 3380 ppm Zn, 8.6 ppm Ag), and could be the same horizon as hosts the mineralization in the upper hole.

Hole DEB-83-8 was drilled beneath Trench #4 from 1982, and which exposed the source bed for the large area of carbonate float in a felsenmeer. This carbonate float was of a breccia with fragments of bedded carbonate, shale and graphite, and contained disseminated pyrite and galena. Mapping had indicated that the trench was close to the major fold axis, and the hole was drilled to intersect the western limb. The hole did intersect the limestone, interbedded with shale but at shallow depths as the dip of the west limb was far flatter than indicated by surface exposure. The limestone, nor the shales were mineralized, but the upper part of the shale, with the IP anomaly on line 13+00N, and equivalent to the mineralization host in hole DEB-83-6 was not intersected.

The shales in the holes in the Trench area, numbers 4, 5, 6, 7 and 8 could all be divided into an upper unit with particularly black shale, containing the limestone and altered tuff beds, and a lower, very well-bedded shale, that in some holes was intensely deformed and contorted in numerous tight folds. The upper, black-shales also contains frequent qyartz crystals or grains with distinct pressure shadows, with locally up to 50% of quartz grains over 1-2 cm; is often sideritic, both bedded and disseminated, and pyritic; contains abundant quartz-carbonate veinlets; and contains oncolitic limestone, quartzite and lead-zinc mineralization. The lower shale is well-bedded, generally grey with only thin laminae of blacker shale; and in some holes is very distinctive in the contortions demonstrated by the bedding. It is unclear whether these contortions are primary slump features or purely structural, but they are all cut by the vertical foliation, with no apparent cleavage or foliation corresponding to these contortions, which appear to be oriented in random directions.

12.3 Malachite Adit Showing

Three holes were drilled in an attempt to intersect the bedded sphalerite seen on the "Malachite Adit" showing. This showing is not in the adit, but in a trench above it, and consists of up to 15 cm of well-bedded sphalerite (Appendix I, polished-section descriptions) in "F" shales immediately above the "F" limestone. DEB-83-9 was drilled just above the showing to intersect the dip of the showing. It intersected well-bedded shales typical of the upper part of "F" (Fs_2) then a far darker shale with abundant disseminated siderite and thin calcareous bands immediately above the limestone which here is generally massive. No mineralization was intersected. DEB-83-10 was drilled 30 m further grid south, up-hill of the showing and intersected a similar sequence. However in this hole, at the same position as the bedded sphalerite, a vein of semi-massive arsenopyrite was intersected with trace galena and sphalerite (0.20% Pb, 2.43% Zn, 0.32 oz/t Ag).

DEB-83-11 was drilled as an undercut to this hole, was similar in geology, and in the same position as the arsenopyrite (i.e. above the limestone in the darker, sideritic shales), intersected galena and sphalerite in association with quartz-carbonate veins (2.47% Pb, 5.05% Zn, 0.5 oz/t Ag over 0.25 m).

Diamond drilling, mobilization from Vermont Creek.

Diamond drilling, hole DEB-83-9 at the Malachite Adit showing.

13. MINERALIZATION AND ALTERATION

13.1 Polished Sections of Mineralization

A study was made of seven polished sections, two from the outcrop of the "Malachite Adit" showing, and five from diamond drill-core mineralization (Appendix I).

The two samples from the adit are "clearly examples of sedimentary hosted Pb-Zn mineralization" (Appendix I). "Banding (apparently conformable with bedding) is defined by well-developed layers on the scale of a millimetre or less of predominantly sphalerite mineralization". "The bands of sulphide vary in relative proportions of sphalerite, galena and chalcopyrite".

The mineralization in DEB-83-10 was confirmed as massive arsenopyrite. It contains bands of pyrite, highly corroded, with replacement by sphalerite, galena and chalcopyrite with accessary tetrahedrite and argentite, the very same assemblage as in the bedded mineralization in the showing.

The mineralization in DEB-83-6 was confirmed as near massive sphalerite, with galena and pyrite. All three display evidence of brittle deformation. As in the Adit showing the sphalerite contains inclusions of chalcopyrite. Also the sphalerite is rimmed by arsenopyrite, with pyrite overgrowths on arsenopyrite. Silver mineralization is clearly late, intimately associated with galena and remobilization of Pb, Cu, Ag and S.

Malachite Detail, looking southeast from Carbonate Mountain. The central ridge is on "F" shale, with the distinct gully on the carbonate. The Adit showing is at the intersection of the arrows marked "A". The "E" grit separating the "D" and "F" shales is the lighter coloured band at the intersection of the arrows marked "B".

The Malachite Adit showing; bedded sphalerite about 15 cm wide in black-shale; the fallen block with the penknife is also bedded sphalerite.

The mineralization at the "SR Showing" was confirmed as galena with inclusions of tetrahedrite and pyrite, the latter hosting chalcopyrite, argentite and native gold.

Overall the polished sections demonstrated that there is a mineralogical and textural association between the clearly bedded (stratiform) mineralization in the Adit showing and the vein-like, but stratabound mineralization in holes 6 and 10 and in the SR showing. That these veins are stratabound, and brittly deformed would indicate that they were formed prior to the regional deformation event that formed the slaty cleavage. They may therefore be sweats derived from the bedded mineralization that migrated along the bedding planes, and indicate that stratabound mineralization may be present around these veins along the appropriate horizons.

13.2 Thin Sections of Core

Thirty-seven thin-sections of core were prepared and analysed microscopically. These covered most of units "D", "E" and "F". (Appendix J).

The thin-sections (Table 12) indicate that most of the shales are composed of quartz (5-10%), carbonate (5-30%), and sericite or muscovite (60-88%), with minor accessory pyrite. The blacker shales contain layers of apparent solution thinning of compressed sericite with unidentified clays. The calcareous shales contain up to 65% carbonate, with proportionally less quartz and sericite. The layering seen in the shales is either due to sericite and carbonate rich layers, to concentration of sericite and muscovite, or to sericite layers of variable thickness.

TABLE 12

SUMMARY OF THIN-SECTIONS

Hole No.	Meterage	Lithology	Q.	C.	S.	% Op.	Other
83-4	22.0	Calcar. siltstone	86	8	1	py 5	
83-4	23.9	Calcar. shale	10	29	60	py 1	
83-4	28.0	Deformed, argillaceous	33	15	60	py 2	
83-4	29.9	Altered mafic volc.	-	71	10	py, mag. 15	Serpentine (olivine) 3
83-4	30.1	Altered mafic volc.	-	71	10	py, mag. 15	Serpentine (olivine) 3
83-4	50.7	Shale	5	20	73	py 2	
83-6	21.7	Shale	9	30	60	py 1	
83-6	22.3	Shale, deformed	8	15	75	py	Sphalerite
83-6	27.1	Altered mafic volc.	-	71	10	py, mag. 15	Serpentine (olivine) 3
83-6	28.5	Calc. shale	9	30	60	py 1	
83-7	3.3	Calc. qtz. sandstone	75	16	8	py 1	Tourmaline 1
83-7	21.0	Calc. qtz. sandstone	65	34	1		Zircon 1
83-7	27.6	Shaley limestone	7	52	40	py 1	
83-7	34.2	Qtz. limestone	10	88	1	py 1	(oolitic)
83-7	35.4	Oolitic limestone	3	96	-	py 1	(shale fragments)
83-7	36.6	Calc. shale	8	65	25	op 2	
83-8	12.3	Calc. shale	5	60	30	py 5	
83-8	15.4	Calc. shale	8	40	51	py 1	(algal oncolite)
83-8	34.2	Shale	15	24	60		Zircon, tourmaline
83-9	21.9	Shale	10	5	88		
83-9	27.6	Calc. shale	8	30	60	py 2	
83-9	30.9	Shale, calc. siltstone	8	30	60		
83-9	33.3	Sandy limestone	25	69	1		Plagioclase
83-9	41.4	Sandy limestone	25	70	5		
83-9	45.9	Shaly limestone		55	20		Q+Py 25% pressure shadow
83-9	46.2	Impure limestone		70	30		
83-11	47.1	Quartzite in shale	85	5	1		Sphalerite, 9%
83-11	47.4	Calc. shale	8	30	60	2	Sphalerite
83-11	47.1	Impure Limestone	19	50	30	1	Apatite
83-Adit Showing		Calc. sandstone		15	40	py 10	Sphalerite, 35%) bands
			30	25	10	py 10	Sphalerite, 25%)
S.R. Showing		Altered mafic volc.	10	70	5	15	
Trench 4		Limestone (marble)	4	92	1	3	

Qtz = quartz
Calc. = calcareous
Volc. = volcanic
Q = quartz

C = carbonate
S = sericite
Op = opaques
py = pyrite

mag. = magnetite

The limestones include definite oolitic, oncolitic and algal structures. The carbonate in the shales could not be distinguished from calcite, though it often weathers brown and has in this report been referred to as siderite. To determine its exact mineralogy would require other techniques.

The quartz sandstone, and siltstones contain accessory zircon and tourmaline, as well as plagioclase.

As a result of the thin-section study, the rock identified in the field and the logs as "green-rock" or quartzite with green minerals, has been identified as highly altered mafic volcanics. It contains phenocrysts, probably after olivine, of serpentine and chlorite with opaques, or of calcite quartz and muscovite, probably after calcium-feldspar(?).

13.3 Discussion

Much of the carbonate, particularly the siderite, together with the pyrite and the dissolution textures suggest that the host-rocks to the mineralization are highly altered. Indeed much of the "blackness" of the shales is obviously due to these alteration features, rather than any specific variation in the carbon content of the various shales.

The association of these black-shale areas and sequences with the mafic-volcanics, and with the mineralization, indicates that the alteration and mineralization is most probably diagenetic, or pre-deformation, as such features occur along bedding, rather than the now more dominant foliation, cleavage planes. In other words the alteration is probably the result of a sea-floor geothermal system, with the resulting implications regarding the genesis of the mineralization.

Though a number of the showings, and the intersections in the holes were of veins of galena and sphalerite (with or without arsenopyrite), all of these were in stratigraphic positions identical to observed bedded, and either disseminated or semi-massive mineralization. They are also, as noted above within an area of alteration, as iron-carbonate and as dissolution textures, and with altered mafic volcanics suggesting diagenetic alteration and mineralization. In addition they are concentrated at Malachite Creek, and potentially at Carbonate Mountain and Silent Pass, in areas of considerable structure that may in part be syndepositional, and of apparent changes in thickness of individual stratigraphic units suggesting depositional basins and growth faults. All these features are considered to be particularly favourable for the presence of a stratabound mineral deposit (with or without a footwall mineralized-alteration pipe), and probably within relatively close proximity to the known showings, volcanics and areas of alteration.

14. CONCLUSIONS AND RECOMMENDATIONS

- The 1983 program confirmed the presence of a mineralized, and locally highly altered and mineralized, sequence of black shale throughout two areas of the property, but particularly in the Malachite Creek area where efforts have been concentrated to date. Though no economic deposits have been located to date, the mineralization, the alteration, the favourable stratigraphy, the IP anomalies, and the remaining unexplained geochemical anomalies all indicate significant remaining potential.

- At Silent Lake the soil geochemistry has indicated at least one major anomaly, in an area of uncertain geology (line S2) and two additional priority anomalies related to black shales in the "A" and "D" units. Further prospecting, mapping, soil geochemistry on grids to cover the shale units where they are anomalous, and eventually an IP survey are recommended.

- Further attempts should be made to acquire the Crown Point property to follow-up the mineralization in 1982.

- The Crown Point cabins geochemical anomaly is now considered to be probably caused by contamination from the Crown Point Adit, and the cabins core-storage facility. The IP anomaly in this area, on the south-west end of the line, and along the property boundary with the Crown grants remains a target to be followed-up, initially by an IP line along the property boundary.

- The anomalies between Crown Point and Carbonate Mountain discovered in 1980, 1981 and 1982 require follow-up on a lower priority basis.

- The Carbonate Mountain area contains two distinct, sub-surface IP anomalies within black-shales, one of which corresponds with a weak soil-geochemical anomaly on its up-dip projection. Further IP surveys, and soil geochemistry are recommended in this area to better delineate, and find the best parts of these anomalies, prior to drilling.

- A strong soil-geochemical anomaly extends either side of Malachite Creek at low elevations and may be derived from the "D" shale. A grab sample taken in 1981 from a limestone horizon in this general area was anomalous. Further prospecting, and geological mapping is required in this area, which in general will be unsuitable for further IP or geochemical surveys because of the bouldery terrain.

- The Malachite Detail area, on the west limb of the anticlinorium contains a sequence of highly altered black-shales, in an apparently condensed stratigraphic sequence. Though drill testing of the obvious surface mineralization showings has not led to equal or better mineralization at depth, various features of the intersected mineralization, and particularly of the Malachite Adit and SR showings, are strongly indicative of nearby bedded mineralization of the black-shale, "sedex" type that is the target of the program.

- The IP survey at Malachite Detail located a number of deeper, sub-surface anomalies than the one tested in hole #7 and which intersected high grades, but over a narrow interval. The broader separation of the reconnaissance 50 m data would suggest that some of the deeper anomalies in this data may be due to larger or stronger sources. However before any further drilling is undertaken, additional IP surveys are recommended at closer line spacings of 100 m, against the present 300 m, and with closer electrode spacing. Consideration should also be given to other geophysical techniques such as time-domain EM.

- Eventually consideration should be given to drilling the Malachite Detail, and possibly other, areas to test these anomalies, and others as will inevitably develop from the recommended surveys, prospecting and geological mapping. In the end, and if encouraging results warrent, it may be necessary to pattern drill the favourable stratigraphy and alteration sequences to suitable depths in order to locate economic mineralization.

- Overall the property remains one of considerable merit, but it must be recognized that a long term program of further work is going to be required if a deposit is to be found, particularly now that the surface showings at Malachite have been tested, with in a local sense, negative results.

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