MAR 19740006: BIGHORN

Received date: Dec 31, 1974

Public release date: Jan 01, 1976

K I N T L A   E X P L O R A T I O N S   L I M I T E D

FINAL GEOLOGICAL REPORT

1972 - 1973

PROGRAMS

BIGHORN CLAIMS

YARROW CREEK - SPIONKOP CREEK

SOUTHWESTERN ALBERTA

EDMONTON, Alberta

March, 1974

E. Goble

R.J. Goble

C O N T E N T S

PREVIOUS GEOLOGICAL WORK IN THE AREA

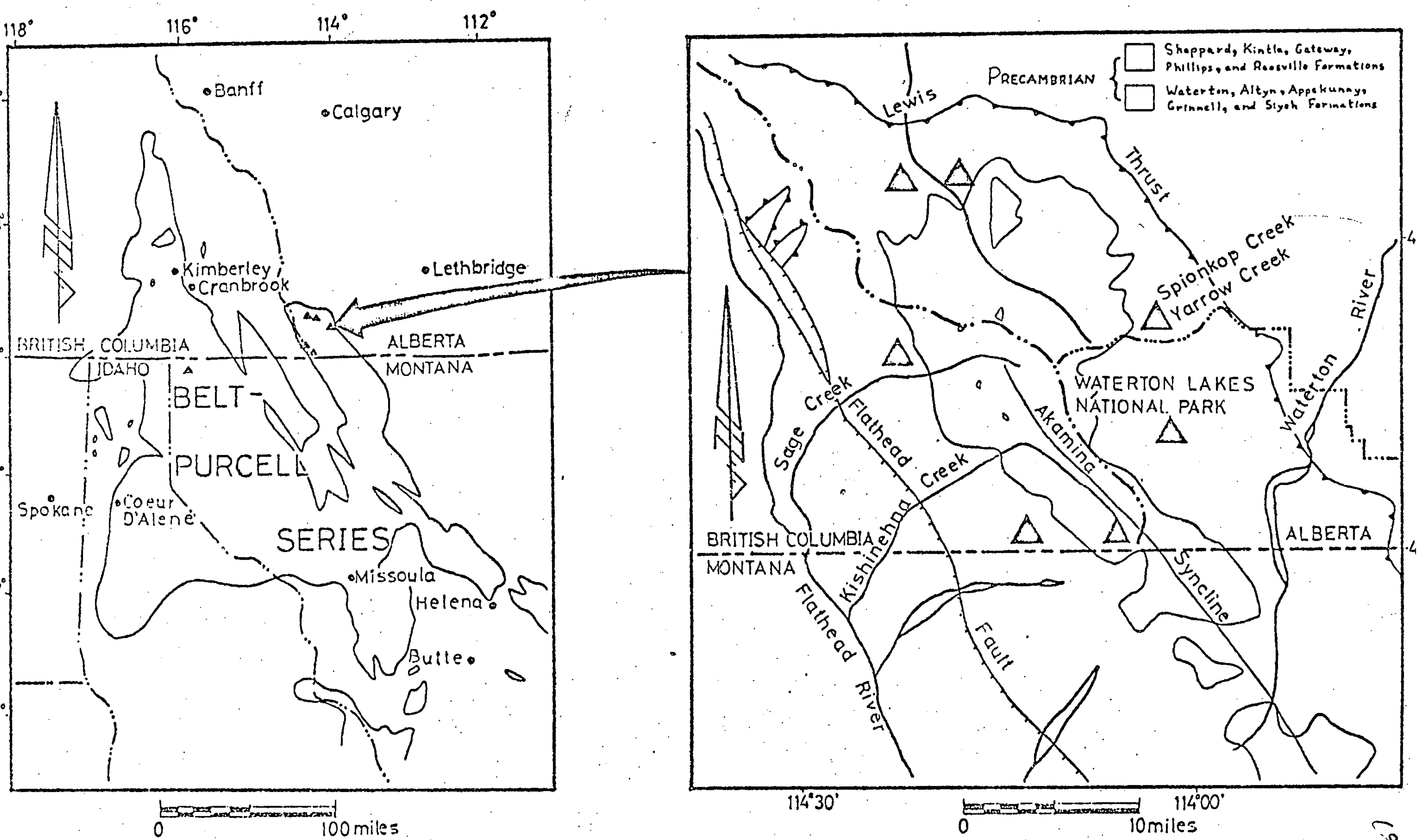
Reconnaissance geological studies of the area were carried out by Dawson (1886), Daly (1912), Hume (1932), and Clapp (1932). Fenton and Fenton (1937) studied the Lewis series in Waterton Lakes and Glacier National Parks and defined the Appekunny and Grinnell Formations. Douglas (1953) mapped the Waterton Lakes National Park area and Price (1962) mapped the Flathead map area. Hunt (1958, 1961) studied the intensive diabasic sills and the Purcell extrusives within the area. Stevenson (1968) prepared a detailed geological map of Yarrow Creek - Spionkop Creek district.

REGIONAL SETTING

The Big Horn claims are situated within the Clarke Range of the Rocky Mountains near the Canada - United States border. The area lies approximately fifteen miles north of the southwest corner of Alberta, between latitudes 49° 12' N and 49° 14' N, and between longitudes 113° 59' W and 114° 01' W (See Fig. 1). The area is moderately rugged with maximum relief of 2,500 feet. Access is good via gravel roads up Yarrow and Spionkop Creeks to the base of Spionkop Ridge, these roads being maintained year-round. A four-wheel drive road up Spionkop Ridge from Spionkop Creek is presently passable only during the period from June 1 to October 31. Winter access is restricted by an annual snow-fall of approximately 80 inches. Ridge tops and south facing slopes are generally accessible almost year-round. Power lines and gas pipelines parallel the gravel roads along Yarrow and Spionkop Creeks and continue to Shell Oil's sulfur plant at Pecten, some 6 miles to the north-east, the nearest location of a railroad. Regional access is excellent via Highways 2 and 3 to Pincher Creek, Alberta, some 18 miles north of the property, and Highway 5 from Pincher Creek to Waterton Park which passes some 8 miles east of the property.

GEOLOGICAL AND TECTONIC SETTING

The Lewis series and its equivalent, the Purcell supergroup, is exposed in Canada south of latitude 51° N in three major tectonic units, the Purcell arch, the Western Rocky Mountain fault complex, and the Lewis thrust plate (Burwash, 1968). The Lewis series outcrops within the Lewis thrust plate which is a sheet of gently folded almost horizontal Precambrian strata which has been thrust over Paleozoic and Mesozoic formations. It is folded into a series of en-echelon structures which trend south to southeast. Bostock _et al_. (1959) conclude that the most dominant of the folds, the Akamina syncline, parallels the Purcell anticlinorium, forming most of the Rocky



△ KNOWN CU OCCURRENCES IN BELT-PURCELL SERIES

Figure 1: Geological and location map of Lewis Thrust Sheet (after Price, 1965).

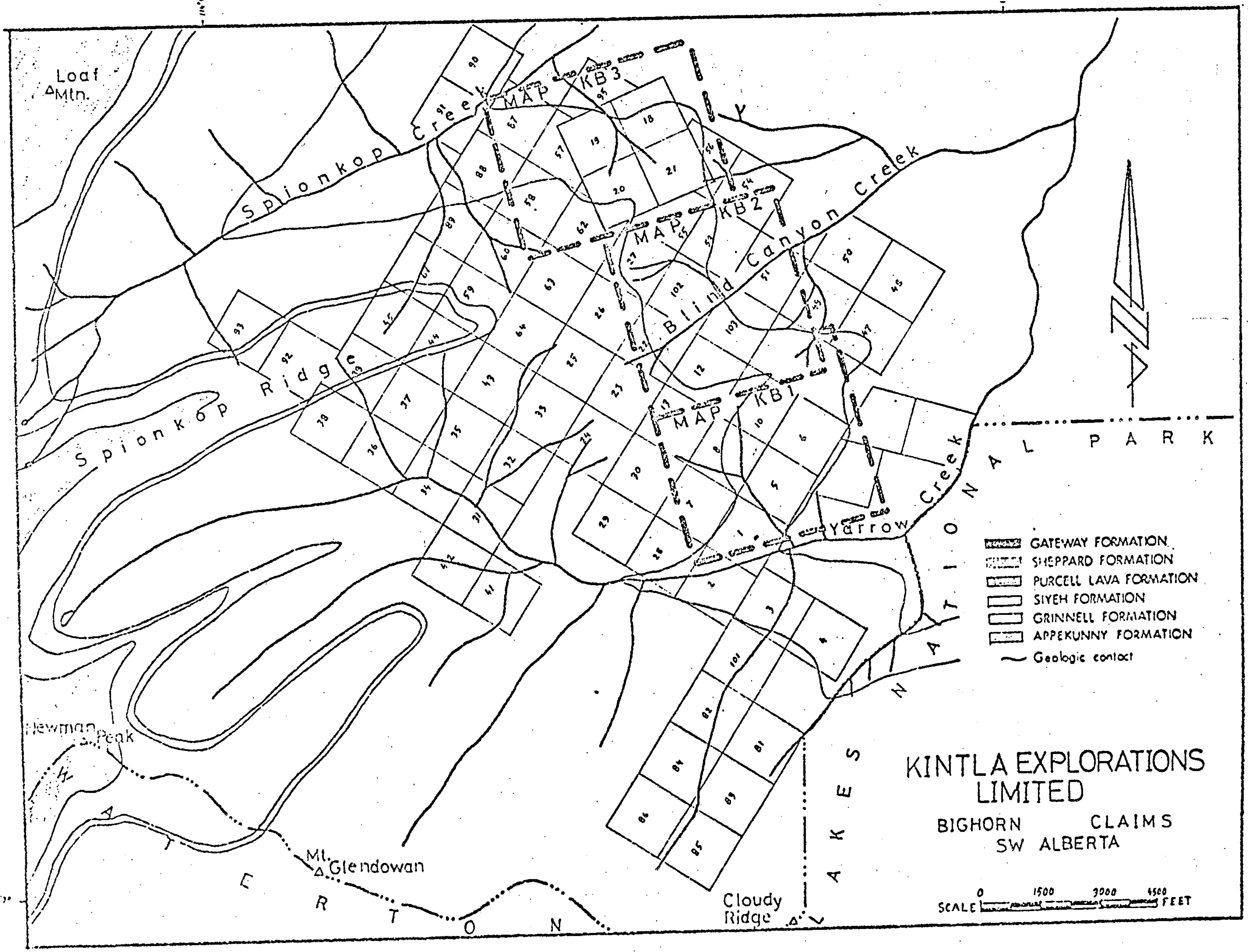


Figure 2: Geological and claim map of Bighorn Claims (after Goble and Morton, 1971).

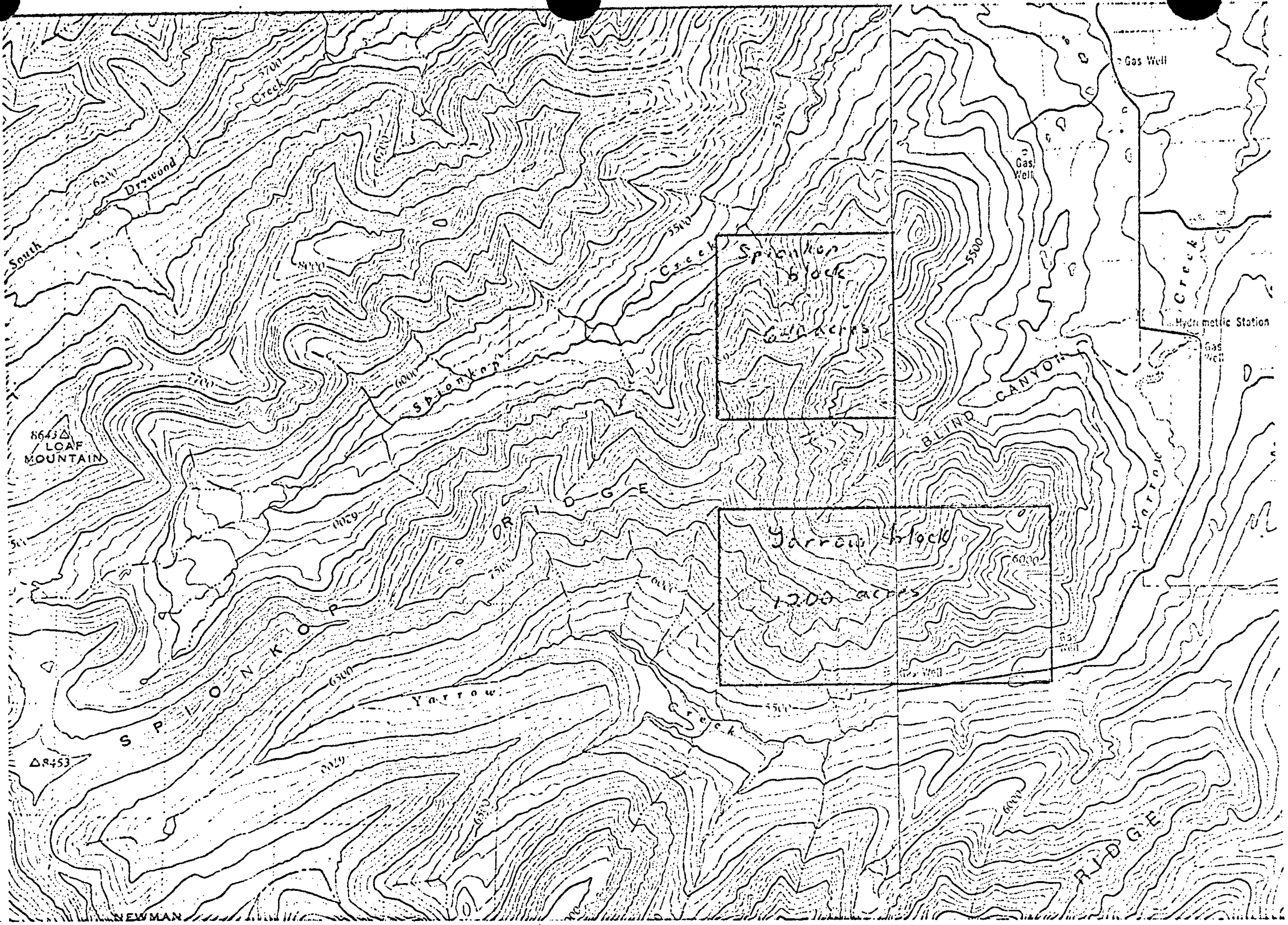
(1b)

1974/0006

ERA	PERIOD OR EPOCH	GROUP	FORMATION	LITHOLOGY	THICKNESS (feet)
			EROSIONAL UNCONFORMITY		
PRECAMBRIAN	PURCELL		MOYIE INTRUSIONS	Diorite sills and dykes	
PRECAMBRIAN	PURCELL (LEWIS)	GATEWAY KINTLA	ROOSVILLE FORMATION	Green argillite, siltstone, sandstone, stromatolitic dolomite	3500±
		GATEWAY KINTLA	PHILLIPS FORMATION	Red sandstone, siltstone, argillite	500- 700
		GATEWAY KINTLA	GATEWAY FORMATION (upper member)	Argillite, argillaceous siltstone, dolomite dolomitic sandstone, and argillite	1150-3000
		GATEWAY KINTLA	SHEPPARD FORMATION	Quartzitic & dolomitic sandstone, dolomite, oolitic dolomite, argillite, siltstone, pillowed andesite	150- 900
			EROSIONAL UNCONFORMITY IN PART		
			PURCELL LAVA	Chloritized andesite, & amygdaloidal andesite, pillowed andesite	00- 600
			SIYEH FORMATION	Limestone, dolomite, argillite & sandy limestone & dolomite, argillite, stromatolitic limestone	1130-3000
			GRINNELL FORMATION	Red argillite, sandstone & siltstone; white, green & red quartzite	350-1700
			APPEKUNNY FORMATION	Green argillite; white, grey & green quartzite; sandy argillaceous dolomite & dolomitic argillite; siltstone	1500-2000
			ALTYN FORMATION	Argillaceous limestone & dolomite; sandy dolomite, argillite, & stromatolitic dolomite	500-4000
			WATERTON FORMATION	Limestone & dolomite, argillite, & argillaceous dolomite	1500+

Figure 3: Stratigraphic succession of SW Canadian Precambrian (after Price, 1962).

1974006b



BIG HORN CLAIMS

KINTLA EXPLORATIONS LIMITED

FIGURE 4

19740006

Mountain Trench. Mume (1932) concludes that this warping occurred subsequent to the movement along the Lewis Thrust.

The Lewis thrust sheet is cut to the west by the Flathead fault, one of a set of normal faults formed subsequent to the thrusting. Bally et al. (1966) believe that this is a listric normal fault formed after emplacement of the Lewis overthrust by 'back-slippage' along a pre-existing thrust during a post-orogenic uplifting. Jones (1969) classifies the thrusting and subsequent normal faulting as part of the Laramide orogeny of the Middle Paleocene and Eocene. Movement of the Flathead fault is believed to have continued well into the Oligocene.

Regional metamorphism within the Lewis thrust sheet is of low grade. Leach (1962) found that in the western Rockies this metamorphism was near the transition from the quartz-albite-epidote-biotite subfacies to the quartz-albite-epidote-almandine subfacies. This metamorphism occurred during the East Kootenay orogeny at approximately 750 million years ago (Burwash et al.,1965).

The Precambrian Appekunny, Grinnell, Siyeh, Purcell Lava, and Sheppard formations as mapped by Price (1962), outcrop on the Big Horn claims (Fig. 2). For the most part these consist of quartzites, argillites, and carbonates, with minor intercalated submarine lavas (Fig. 3). Ressor (1957) and Price (1964) postulated that the Lewis series sediments, of which these are a part, were deposited in the shallow waters of a deltaic basin and were in part of subaerial origin. Smith and Barnes (1966) recognize cyclic deep-shallow water depositional phases in the Montana equivalents of the Lewis series. One such cycle terminates at the base of the Siyeh Formation, with the Appekunny and Grinnell formations representing the shallow water half of the cycle. Waldron (1942) points out that the Appekunny and Grinnell formations may be differently coloured phases of one formation, with the line of distinction between them being one oblique to the stratification.

The sediments have been intruded by a series of amygdaloidal porphyritic quartz-diabase sills and dykes up to 100 feet thick. These are of Precambrian age and possible contemporaneous with the extrusion of the Purcell lavas (1130 ± 20 m.y.).

The Precambrian rocks in this area are present as part of the Lewis thrust sheet, in which Precambrian sediments have been thrust from the southwest over the younger Paleozoic and Mesozoic sediments. According to Price (1962), the thrust sheet is characterized by a series of thrust faults and associated folds, cut by younger SE- or W- dipping normal faults. Price (1967) also describes a series of NE-trending transverse faults found within the Clarke Range.

METALIFEROUS DEPOSITS

Dawson (1886) first reported the occurrence of copper in the North Kootenay Pass region of the Lewis thrust sheet in the form of chalcopyrite within the Purcell lavas and diabasic dykes. Ross (1959) noted exploration activity within Glacier National Park around 1890 centered on copper-lead-silver ore near the heads of Quartz and Mineral Creeks (within the Grinnell and Siyeh Formations). He also reported the staking of some one hundred claims in 1898 on two parallel chalcopyrite veins associated with intrusive metagabbro dykes. During the first decade of the 20th century, small scale mining was also undertaken within Waterton Lakes and Glacier National Parks. This was centered on two copper-bearing diabase dykes within the Grinnell Formation on Blakiston Brook in Waterton Lakes National Park, and on a gold deposit in the Waterton Formation on Chief Mountain in Glacier National Park.

Outcrops of cupriferous quartzite in the Yarrow Creek area were initially staked during this period, but the claims were never recorded. Interest in the area lapsed until 1963 when Erik and Frank Goble staked the first 10 of 75 Big Horn claims. Kennco Explorations Limited examined the property in 1967, during which time mapping and prospecting outlined a possible 1,000,000 tons of up to 3.5% copper ore in a diabase sill on Spionkop Ridge.

OUTLINE OF THE 1972-73 (SPRING) PROGRAM

In May 1972 a program of mapping prospecting and sampling was undertaken by Kintla on the Big Horn claims. The purpose of the program was to duplicate the pre-1972 samples, to take additional samples from the same mineralized beds between the primary sampling sites, and to map and correlate the sections. The main targets were:

1) A 5-8 foot thick bornite-covellite-chalcocite mineralized quartzite bed continuous along strike from just north of Yarrow Creek, through the Blind Canyon to just south of Spionkop Creek, approximately 3 miles, with copper values of from 1 to 2.5%.

2) A 12-30 foot thick diorite sill with a 3-8 foot chilled margin, described by R.W. Stevenson as containing from 1.83 to 3.45% copper and with up to 0.86 ounces silver per ton.

3) A high silver showing on Yarrow Creek near the south end of the quartzite bed mentioned in (1), which assayed at 59.38 ounces silver per ton and 3.7% copper; and a 2.22 ounces silver per ton showing in the apparently unmineralized central portion of the main diorite sill where it crosses Yarrow Creek.

4) An area of old trenches where faulting has apparently pushed mineralized Appekunny strata into the lower Grinnell formation.

5) An area of high bornite-covellite assays, approximately 1,000 feet by 300 feet, covering roughly 200 feet of section in the upper Grinnell north of Yarrow Creek, of which one (the lowest quartzite) is the southern end of the bed described in (1).

6) The numerous 6-10 foot thick diorite dykes and sills north of Yarrow Creek which carry desseminated chalcopyrite and/or bornite and chalcocite.

One geologist, one prospector, three full-time and two part-time assistants were employed mapping, prospecting and sampling an area of about 2,000 acres covering the Grinnell, and parts of the Siyeh and Appekunny Formations. The program was carried out between times of preparation of the field camp on the Commerce Mountain gold-silver-copper property.

Mapping was carried out on a scale of one inch to two hundred feet with control by chain and compass. A two hundred foot interval grid with two hundred foot stations was used on the main showings and a four hundred foot interval grid with two hundred foot stations was used on areas of lesser interest. Elevations of stations were determined using an altimeter having a precision of approximately 10 feet, and which was adjusted daily to the first base line peg (yo peg) having an assumed elevation of 5130 feet (based on the first day reading with the altimeter set at 4200 feet at the Waterton townsite).

The results of the field work are plotted on the maps accompanying this report, and are summarized below.

RESULTS

Mapping on the Big Horn claims was confined to the Grinnell formation except in areas where prospecting revealed mineralized horizons in the Appekunny or Siyeh formations. Maps KB-1, KB-2, KB-3 (Kintla-Big Horn-No. 1, 2, 3,) show local geology and sample locations and values for the Yarrow Creek, Blind Canyon, and Spionkop Creek map areas respectively.

YARROW CREEK

Geology-

The stratigraphic succession in the Yarrow Creek map area is Appekunny formation, Grinnell formation, and Siyeh formation, moving upwards. The Appekunny formation consists of dominantly green and white argillites and quartzites, grading over a short interval into the dominantly red argillites of the lower Grinnell. Reddish quartzites and minor white and greenish quartzites become more prevalent in the upper Grinnell formation and grade into the black shales and buff quartzites of the lower Siyeh. These in turn give way to the carbonates which make up the bulk of the Siyeh Formation.

The sediments strike approximately N 140^{o} E and dip at approximately 25^{o} SW. Numerous diabase sills and dykes intrude the sediments, the most prominent being a large sill (up to 100 feet thick) which is found approximately 20 feet below the top of the Appekunny formation throughout the Yarrow Creek map area. A concentration of sills and dykes lies in the upper Grinnel in the Yarrow-Main zone.

The sediments in the Yarrow Creek map area are cut by numerous reverse faults striking N 10^{o} W to N 60^{o} W and dipping from 70^{o} to 90^{o} SW. A few thrust faults striking approximately N 45^{o} E and dipping from 15^{o} to 25^{o} SE are also present. Stevenson (1968) noted that some faults cut the lower Grinnell but not the diabase sill in the upper Appekunny, and concluded from this that some of the faulting was caused by the intrusion of this diabase sill into the incompetent sediments. Some of the faults cut the sills and dykes while other fault zones are occupied by dykes, indicating that at least some of the faulting was post-intrusive.

Mineralization-

The mineralization in the Yarrow Creek map area consists of copper-silver and minor lead mineralization of quartzites, sandstones, and intrusives, all within the Grinnell formation, and one limited exposure of Appekunny qyartz sandstones. Mineralization is in the form of covellite, anilite, bornite, and rarely chalcopyrite, disseminated in quartzites and in the chilled margins of the diabase sills and dykes. Bornite and covellite are frequently present as veinlets within argillite pebbles found throughout the quartzite beds.

The diabase sills and dykes intrude the fault planes of SW- or W- dipping normal or reverse faults. A major overthrust of the upper Grinnell over the base of the Siyeh occurs in the northern part of the Main zone.

The Yarrow Creek area consists of four areas of interest as follows:

1) Quartzite unit 19: (see appended type section)
This unit has been traced from 22+00 feet N, 1+00 feet W to 62+00 feet N, 26+00 feet W, with representative assays (from S to N) of:

1- 1.01% Cu, 0.15 oz Ag, 9'.

2- 0.38% Cu, 0.02 oz Ag, 9'.

3- Several assays of mineralized blocks of unit 19 quartzite float on the south side of the outcrop of the ridge from 22+00 feet N, 1+00 W to 22+00 N, 10+00 E; averaging 2.5% copper.

4- Several blocks of mineralized quartzite of unit 19 as float on the SW outcrop of the unit, from 22+00 N and 10+00 E to 34+00 N and 11+00 E; averagine 1.8 to 3.2% copper.

5- 1.33% Cu, 0.16 oz Ag, 5' thickness.

6- 1.82% Cu, 0.18 oz Ag, 6' thickness.

7- 3.60% Cu, 0.60 oz Ag, 1' top of bed only.

8- 1.94% Cu, 0.26 oz Ag, minimum of 3.5'width.

9- 1.49% Cu, 0.27 oz Ag, minimum 8', may be overlying bed.

10- 2.50% Cu, 0.45 oz Ag, minimum 4'.

11- 6.70% Cu, - Ag, top 18" of bed.

12- 3.38% Cu, 1.20 oz Ag, 8'.

13- 1.66% Cu, 0.51 oz Ag, 6'.

14- 0.81% Cu, 0.03 oz Ag, 6'base of bed.

15- 1.76% Cu, 0.24 oz Ag, 7' (on map KB-2).

These samples represent a block of quartzite some 4,000 feet in lenth (north to south), and 2,000 feet in breadth (east to west). The best exposed portion of this block is 2,000 feet by 1,400 feet with an average thickness of 8 feet, and consists of the first 14 above assays, comprising a potential 2.4 million tons of 2.0 to 2.25 % copper and 0.15 to 0.25 oz Ag in that portion of the larger block. The larger block contains a potential 4.0 million tons of similar grade ore, even without allowing for extensions north or south, or down dip beyond that portion directly between the northernmost and southernmost assay points. The quartzite extends beyond these points, and is mineralized at up to 1.36% copper, but contains a barren zone of 0.05 to 0.10 % copper some 500 to 1,500 feet north of the 1.76 % Cu assay point.

see Report No. CU-AF-041(9)

This major drill target and several minor targets in the Yarrow Creek area are outlined in red on map KB-1. The minor drill targets are small tonnage - high grade showings which would warrant further work only if a major program was undertaken on the above quartzite unit. Low-grade mineralization has also been noted within the Appekunny Formation quartzites. Grade runs from 0.1 to 0.3 % Cu across 30-40 feet, and apparently represent leached values of the much richer Appekunny quartzites and sandstones which have been pushed through the lower Grinnell formation along a major wrench fault. These rocks are exposed at the "trenches", old pits dug by the original stakers in the early years of the twentieth century, located at 13+00 N and 2+00 E. The Appekunny quartzites at the "trench" assay at between 1.0 and 3.5 % copper, with most of the copper present as malachite, although a few of the larger blocks of quartzite contain bands of bornite-covellite 8-12 inches in length and 1/3 to 1/2 inch in thickness. This occurrence is close to the center of the intrusives cutting through the large poorly mineralized diabase sill at the top of the Appekunny, and may represent mineralization emplaced as a result of the impoundment of the intrusives below the large sill.

YL ZONE

The YL zone is an exposure of galena bearing lower Siyeh carbonates northwest of the main zone. The mineralization is in the form of disseminated galena and fracture-filling galena in an extensive shatter zone above a galena bearing diabase dyke. Minor veins of galena, chalcopyrite, and sphalerite occur above the main mineralized area, and are apparently related to it. A northwesterly trending fault extends through the zone and may connect with a similar northwesterly trending fault cutting through the copper zone to the southeast. Minor lead mineralization also occurs 1,300 feet southeast of the main lead zone alongside the fault mentioned above. This is in the form of disseminated galena within the lower Siyeh limestones and mudstones. Assays are as follows:

1- 4.96 % Pb, 0.12 oz Ag, 10'.
2- 57.35 % Pb, 2.35 oz Ag, 4'.
3- 52.20 % Pb, 5.25 oz Ag, 4'.
4- 3.38 % Pb, 0.24 oz Ag, 5'.
5- 0.62 % Pb, 0.48 % Zn, 1' vein.
6- 0.14 % Pb, 0.07 % Zn, 1' vein.

SPIONKOP CREEK

The stratigraphic succession in the Spionkop Creek map area is, as in the Yarrow Creek map area, Appekunny formation, Grinnell formation, and Siyeh formation. The sediments are similar, although in the Spionkop Creek area there is a noticeable scarcity of muc cracks within the Grinnell sediments as compared to the Grinnell sedements in the Yarrow Creek area.

The sediments strike approximately N 140° E and dip at approximately 20° SW. The large diabase sill found near the top of the Appekunny formation in the Yarrow Creek map area is again present in the south-east and north-west sectors of the map area, but in the area north of 114+00 feet north, the sill transgresses up through the Grinnell formation as a dyke, splits, and outcrops within the upper Grinnell as a series of cupriferous diabase dykes. One or more of these outcrops may represent faulted segments of the same dyke, but there is evidence for at least 5 separate cupriferous dykes. Other minor copper bearing sills and dykes outcrop in this same area.

The sediments in the Spionkop Creek map area are cut by numerous reverse faults striking from N 10° W to N 90° W and dipping from 70° to 90° SW. A faulted repeat of the Grinnell formation containing mineralized diabase dykes occurs to the north-east of the main intrusive zone. The large diabase sill recurs twice to the northwest some 3,200 and 5,600 feet respectively, and is mineralized in both instances.

Representative assays are as follows:

1- 0.68 % Cu, 6' sample.
2- 0.50 % Cu, 6'
3- 0.38 % Cu, 4'
4- 0.80 % Cu, 6'
5- 1.50 % Cu, 3'
6- 2.84 % Cu, 0.79 oz Ag, 8'
7- 3.23 % Cu, 1.10 oz Ag, 3'
8- 1.35 % Cu, 0.30 oz Ag, 8'
9- 3.04 % Cu, 0.83 oz Ag, 8'
10- 1.86 % Cu, 0.28 oz Ag, 12'
11- 6.38 % Cu, 0.62 oz Ag, 3'
12- 1.54 % Cu, 0.09 oz Ag, 7'
13- 4.60 % Cu, 0.09 oz Ag, 11'
14- 2.47 % Cu, 0.95 oz Ag, 8'
15- 0.02 % Cu, tr Ag, 4 foot base of sill
16- 2.21 % Cu, 0.28 oz Ag, 3.5'
17- 2.22 % Cu, 0.37 oz Ag, 6.5'
18- 2.84 % Cu, 0.41 oz Ag, 10'
19- 1.90 % Cu, 0.18 oz Ag, 6.5'
20- 2.80 % Cu, 0.42 oz Ag, 8'
21- 2.65 % Cu, 0.03 oz Ag, 8'
22- 0.02 % Cu, tr Ag, 6' (small barren sill)
23- 0.53 % Cu, 0.11 oz Ag, 3.5'

The continuation of the intrusive 3,200 feet to the west assays at:

1- 1.11 % Cu, 0.26 oz Ag, 16'
2- 1.50 % Cu, 0.30 oz Ag, 15'
3- 0.80 % Cu, 0.10 oz Ag, 6'

The continuation of the intrusive 5,600 feet west of the main intrusive zone assays at:

1- 0.76 % Cu, 0.35 oz Ag, 5' sample, upper contact.
2- 0.38 % Cu, 0.05 oz Ag, 3.5' sample, lower contact.

The faulted extension of the main intrusive zone occurring 1,200 feet east contains disseminated chalcopyrite and bornite assaying 0.75 to 1.0 % copper across 5-8 foot widths.

The quartzites overlying the intrusives, units 8 and 13 are also shown on the map. Unit 8 is exposed for only 600 feet south and 400 feet west of its initial outcrop point directly above the main intrusive area, and assays at 1.85 % copper and 0.04 oz Ag across 4'. Unit 13 outcrops for 1200 feet west and from 122+00 N and 3+00 W to 95+00 N and 15+00 W. Representative assays from this bed are:

1- 1.34 % Cu, 8', southern portion.
2- 1.75 % Cu, 4' minimum thickness.
3- 1.94 % Cu, 0.18 oz Ag, 6.5'
4- 0.66 % Cu, 0.04 oz Ag, 6.5'
5- 1.27 % Cu, 0.16 oz Ag, 8'
6- 1.26 % Cu, 0.11 oz Ag, 8'

The area represents the greatest potential of the property, with a quartzite unit some 3,200 feet in strike length exposed along its dip for 1,200 feet averaging over 1.35 % Cu and 0.1 oz Ag across 6-8' widths combined with the consistently mineralized intrusives just below the quartzites in the section. The intrusives are the most widely mineralized, being 3,600 feet along the southeastern outcrop and 5,600 feet along the northwestern outcrop with thicknesses of from 6 to 16 feet. A triangle based on these dimensions would contain in excess of 14 million tons, with an apparent average grade of 1.9 % Cu and 0.25 oz Ag. However, this apparent grade must be reduced due to the large number of assays from the main intrusive zone, and 1.5 % Cu and 0.25 oz Ag per ton would be more representative.

The copper mineralization in the Spionkop Ridge area is zoned around the main intrusive zone, with a decrease in rank of copper minerals to the south and west, from bornite-covellite in the center, through bornite, bornite-chalcopyrite, chalcopyrite, and finally to chalcopyrite-pyrite assemblages 4,000 to 6,000 feet away (to the south and west respectively).

The bornite-covellite bearing central portion of this intrusive zone represents a potential of 1.2 to 2.4 million tons of ore mineralized at well in excess of 2 % Cu and with up to 0.86 oz Ag per ton.

CONCLUSION

The Big Horn property contains excellent potential for development of major ore bodies in the Yarrow Creek area quartzites of the upper Grinnell formation and in the Spionkop Creek - Spionkop Ridge area of diabase intrusives and quartzites. If exploration can prove the ore to be continuous at depth to the base-lines of triangles defined by the outcrop, 17 to 20 million tons of ore grading at 1.25 to 1.75 % copper and 0.2 to 0.3 oz silver per ton would be proven up.

The excellent lateral extensions of these outcrops combined with their mode of occurrence suggests that the ore should extend underground for considerable distances. The copper-silver mineralization in the quartzites of the Grinnell formation has been proven to be at least in part of syngenetic origin (Goble et al., 1969). The mineralization in the diabase sill at the top of the Appekunny formation has been traced for in excess of 25 miles of outcrop length into Waterton Lakes National Park, and is mineralized at between 0.10 and 1.5 % copper for the entire strike length. The sedimentary nature of deposition of the copper in the quartzites and the known strike length of the intrusion strongly indicate that the mineralization should continue for considerable depths, and that the potential of the property greatly exceeds the estimated 17 to 20 million tons.

TABLE 1

1972 - 1973 ASSAYS

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	Other
1	grab		0.06	0.14% Pb, 0.24% Zn.
2	9	0.45	0.26	
3	1	0.32	0.48	
4	1	0.62	0.19	
5	6	0.25	0.24	
6	7	0.32	0.14	
7	7	0.71	0.48	
8	8	0.29	0.07	
9	8	1.20	0.72	
10	9	1.39	0.24	
11	6	0.65	0.48	
12	7	1.84	0.48	
13	10	0.37	0.02	
14	7	0.59	0.47	
15	10	0.82	0.24	
16	1	0.86	0.72	
17	20	0.54	nd	
18	6	1.08	0.29	
19	4	0.89	0.19	
20	10	0.47	0.36	
21	7	0.25	nd	
22	2	0.84	nd	
23	1	1.76	0.48	
24	7	0.69	nd	
25	12	0.52	0.07	
26	7	3.26	0.24	
27	12	1.30	0.14	
28	9	1.26	nd	
29	10	0.94	0.12	

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER
30	7	0.42	nd	
31	12	0.97	nd	
32	5	0.07	0.10	
33	10	0.38	nd	
34	7	0.10	0.19	
35	grab	1.16	1.68	
36	grab	1.04	0.19	
37	1	0.49	0.26	
38	10	0.31	0.12	
39	6	0.30	0.24	
40	12	0.13	nd	
41	12	0.15	nd	
42	12	0.11	0.24	
43	12	0.21	0.02	
44	12	0.26	0.05	
45	16	0.11	nd	
46	0.3	0.95	0.30	
47	5	0.85	0.21	
48	4	0.68	0.15	
49	7	1.00	0.32	
50	7	3.38	1.20	
51	4	1.72	0.64	
52	4	0.65	0.24	
53	8	0.28	nd	
54	10		0.12	4.96 % Pb
55	4		5.25	52.2 % Pb
56	4		2.35	57.35 % Pb
57	5		0.24	3.38 % Pb
58	1	0.48		0.62 % Pb
59	1	0.07		0.14 % Pb
60	6.5	0.38	0.02	
61	7	1.01	0.10	
62	6	0.86	0.12	

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)
63	14	0.52	0.05
64	7	0.20	tr
65	7	0.39	tr
66	7	0.62	0.09
67	8	1.06	0.08
68	5	1.12	0.14
69	5	1.24	0.15
70	5	1.21	0.11
71	5	1.82	0.16
72	5	1.36	0.46
73	5	0.91	0.11
74	5	0.02	0.12
75	5	0.02	tr
76	5	0.17	tr
77	5	0.39	tr
78	5	0.38	tr
79	5	0.48	tr
80	5	0.53	tr
81	5	0.24	tr
82	5	0.12	tr
83	5	0.12	tr
84	5	0.11	tr
85	5	0.25	tr
86	5	0.09	0.01
87	5	0.21	tr
88	5	0.12	tr
89	5	0.16	tr
90	5	0.08	tr
91	5	0.08	tr
92	5	1.33	0.16
93	6	1.82	0.18
94	1	3.60	0.60
95	grab	1.95	0.26

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER
96	1	1.49	0.27	
97	grab	2.50	0.45	
98	6	1.66	0.51	
99	6	0.81	0.03	
100	4.5	0.77	0.08	
101	float		0.67	16.40 % Pb 1.18 % Zn
102	5	0.42	0.02	
103	7	1.03	0.15	
104	8	0.52	0.12	
105	20	0.17	nd	
106	6.5	1.94	0.18	
107	4	1.95	0.04	
108	6.5	0.66	0.04	
109	8	1.27	0.16	
110	8	1.26	0.11	
111	8	2.84	0.79	
112	8	3.04	0.88	
113	7	1.35	0.30	
114	3	3.23	1.10	
115	7	1.54	0.09	
116	11	4.60	0.09	
117	8	2.47	0.35	
118	11	0.78	0.02	
119	3.5	2.21	0.28	
120	6.5	2.22	0.37	
121	8	2.80	0.42	
122	9	2.80	0.45	
123	10	2.84	0.41	
124	6	0.02	tr	
125	3.5	0.53	0.11	
126	8	0.65	0.03	
127	6.5	1.90	0.18	

SAMPLE NO.	THICKNESS (Ft)	Cu (%)	Ag (oz)	OTHER
128	grab	0.62	nd	
129	7	2.52	0.02	
130	12	2.32	0.10	
131	2	6.40	nd	
132	6	2.44	nd	
133	7	1.88	nd	
134	9	2.36	0.10	
135	4	2.68	0.22	
136	5	4.80	0.66	
137	5	1.60	0.07	
138	8	0.90	0.12	
139	8	2.48	0.12	
140	7	1.78	0.24	
141	8	0.98	0.21	
142	8	0.86	0.12	
143	5	0.32	nd	
144	18	0.56	0.18	
145	3	0.63	0.28	
146	13	0.62	0.17	
147	4	0.30	0.10	
148	3	0.76	0.15	
149	4	0.62	0.15	
150	9	1.01	0.15	
151	9	0.33	0.02	
152	grab	2.72	0.41	
153	grab	1.93	0.37	
154	grab	3.06	0.23	
155	grab	2.40	0.11	
156	grab	1.80	0.03	
157	grab	2.71	0.61	
158	grab	2.10	0.25	
159	grab	3.20	0.17	
160	grab	2.17	0.52	
161	1.5	6.70	nd	
162	7	1.76	0.24	

SAMPLE NO.	THICKNESS (Ft)	Cu (%)	Ag (oz)	OTHER
163	6	0.68	nd	
164	6	0.50	nd	
165	6	0.80	nd	
166	3	1.50	nd	
167	10	1.86	0.28	
168	3	6.38	0.62	
169	8	2.47	0.95	
170	8	2.65	0.03	
171	16	1.11	0.26	
172	15	1.50	0.30	
173	6	0.80	0.10	
174	5	0.76	0.35	
175	3.5	0.38	0.05	
176	4	1.85	0.05	
177	8	1.34	nd	
178	4	1.75	nd	
179	6.5	0.66	0.04	

TABLE 2

GRINNELL TYPE SECTION - YARROW CREEK

Unit #	Thickness	Description
27	5'	massive white quartzite - TOP OF GRINNELL
26	18'	reddish clastic quartzite, minor red argillite
25	12'	dominantly red argillite, minor red clasty quartzite with ripple marks
24	9'	bedded reddish quartzite, bottom 2' limy bed (somewhat rusty) with very well developed load casts; quite massive, ripple marks on top MINERALIZATION DETECTED
23	21'	soft, clasty poorly bedded red quartzite, minor red argillite; topped by 6" of red argillite, quartzite immediately below having good ripple marks MINERALIZATION DETECTED 14' BELOW TOP
22	10'	dominantly red argillite, two thin bands of reddish clasty quartzite
21	14'	poorly bedded soft red clasty quartzite, one 2' band of bedded greenish quartzite in center
20	8½'	mainly red argillite, one 1' band of clasty red quartzite in middle
19	7'	mainly hard greenish-white quartzite <u>top 2'</u> - coarse grained massive 'cap' showing large irregular flute casts and good cross bedding, much darker than 3' directly below <u>next 3'</u> - very massive hard green quartzite weathering reddish on bottom half, some cross bedding <u>next 1'</u> - less massive dirtier quartzite with some cross-bedding, few pebbles <u>bottom 1'</u> - soft thin bedded quartzite containing green argillite pebbles, coarse grained MINERALIZATION DETECTED
18	30'	poorly bedded clasty red quartzite, bottom 1½' cross bedded hard white quartzite, one band of hard white quartzite 1' thick in middle
17	3'	mainly red argillite with two thin quartzite beds in middle
16	7'	<u>top 5'</u> - massive hard greenish quartzite, weathers reddish; some green pebbles <u>middle 1'</u> - red argillite <u>bottom 1'</u> - massive dirty clasty reddish quartzite
15	23'	mainly red argillite with minor clasty red quartzite; 2' band of massive greenish quartzite 10' from base

Unit #	Thickness	Description
14	8'	three bands of hard white quartzite separated by distinct bands of red argillite top 1¼' - top of band hard massive white quartzite with some green pebbles, bottom of band reddish clasty quartzite with good cross bedding; good ripple marks on top of band next 3' - red argillite middle 1' - hard white quartzite with green argillite pebbles, weathers reddish next 1¼' - red argillite bottom 1½' - hard white quartzite
13	45'	red clasty quartzite, red argillite; resistant bands of quartzite up to 1' thick occur at 20' from base MINERALIZATION DETECTED 20' FROM BASE
12	7½'	massive greenish and reddish quartzite, weathered colour light red; minor black-red argillite pebbles near base, greenish quartzite tends to be in middle; minor interbedde discontinuous red argillite bands
11	7'	mainly red argillite, band of 1½' of quartzite through center, band consists of two beds of greenish quartzite topped by one bed of clasty red quartzite with very well developed ripple marks
10	5½'	top 3½' - massive reddish quartzite with minor pebbles, top 1' cleaner and harder with good ripple marks middle ½' - red argillite bottom 1½' - massive greenish quartzite with irregular ripple marks, some green argillite pebbles
9	15'	reddish clasty quartzite and red argillite, no definite beds
8	5'	massive greenish white quartzite; top 2' dark reddish clasty quartzite with cross bedding; next 2½' massive greenish white quartzite with very good cross bedding; bottom 6" heavily weathered greenish white quartzite with green argillite pebbles and poorly developed ripple marks MINERALIZATION DETECTED
7	5½'	mainly red argillite, minor bands of red quartzite
6	7'	three beds of white quartzite separated by 1'-2' of red argillite top 2' - clasty reddish quartzite with red argillite pebbles next 1½' - red argillite middle 1½' - top 3"-5" hard reddish quartzite with irregular ripple marks and flute casts, middle 6" hard reddish quartzite with good ripple marks, bottom 4"-8" clasty reddish quartzite with red and green argillite pebbles

Unit #	Thickness	Description
		next 1¼' - red argillite bottom 3/4' - hard swell sorted white quartzite with green argillite pebbles near bottom; ripple marks
5	26½'	mainly red argillite with irregular bands of soft clasty red quartzite; eight definite bands of reddish quartzite up to 8" thick, quartzite beds better developed near base
4	1½'	reddish clasty quartzite, ripple marks
3	7'	mainly red argillite, two 2"-3" beds of reddish quartzite
2	10'	fine grained very well sorted hard reddish white quartzite; top 8' massive reddish white quartzite, next 1' red argillite, bottom 1' clasty red quartzite tipped with moderately sorted ripple marked red quartzite
1	250'-280' ?	LOWER GRINNELL mainly red argillite, minor greenish argillite, and reddish quartzite

GOBLE SYNDICATE RESULTS

The following list of assays and the attached maps marked pre-1972 assays represent the early work carried out between 1963 and 1971 by the Goble Syndicate. This work, was the basis upon which Kintla Explorations acquired the property in January of 1972, and subsequent to that date work by Kintla has verified the existence of excellent occurrences of copper-silver-lead minerals in the Appekunny, Grinnell, and Siyeh formations on the claim block.

The high silver assay of 59.38 oz per ton and 3.7 % copper has not been refound, but as this was in float in the creek bottom in the main area, the source must be buried further upstream. Similarly the 8.72 oz per ton assay of silver from the Spionkop area was not re-located. Generally the grades of copper-silver found by Kintla were consistent with those reported by the Goble Syndicate, with the exception of a few very high assays which were known to be choice selected samples and so were not duplicated.

The "pit" or "trench" area was not examined in great detail as was initially intended as this would have required diamond drilling through the large diabase sill at the top of the Appekunny formation. Two shallow diamond drill holes carried out by the Goble Syndicate at this point encountered broken but excellently mineralized Appekunny sandstones throughout the entire lenth of the two holes, 35 feet and 32 feet respectively. The cores averaged 2.20 and 2.32 % copper respectively although core recovery with the EX rod was poor (45%). The soil in the trenched area averages in excess of 2.0 % copper although mostly in the form of malachite.

Three targets for exploration were found by the syndicate's work, the main area immediately north of Yarrow Creek, including the southern end of the YS quartzite bed, the YS quartzite bed, and the diabase intrusives on the Spionkop Creek side of the claim block. These are discussed in greater detail in the attached Kintla Explorations Limited report.

Pre - 1972 Assays

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
1	6 - quartzite	0.5	0.10		63+00 W 127+50 N
2	8 - argillite	0.65	tr		63+00 W 127+70 N
3	8 - argillite	0.43	tr		65+00 W 127+75 N
4	30 - intrusive	0.75	0.02		25+00 W 130+00 N
5	5	0.24	0.10		17+50 W 132+00 N
6	5	tr	0.10		27+50 W 134+00 N
7	5	0.42	0.10		30+50 W 131+50 N
8	30	0.28	tr		49+00 W 140+50 N
9	8+ - quartzite	0.83	0.1		32+00 W 127+00 N
10	6 - quartzite	0.71	0.20		10+50 E 126+50 N
11	15 - sill	0.19	tr		12+50 E 128+00 N
12	8 - quartzite	0.30	0.10		58+00 E 127+00 N
13	6 - sill	0.79			2+75 W 102+00 N
14	6 - sill	0.61			0+50 W 98+50 N
15	4 - sill	0.38			2+50 E 93+75 N
16	8 - quartzite	1.08			18+00 W 80+50 N
17	8 - quartzite	1.12			20+00 W 92+50 N
18	4 - diorite	0.39			48+60 W 141+00 N
19	6 - diorite	0.53			49+00 W 141+00 N

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
20	6	0.88			26+00 W 128+00 N
21	1-1.5 - vein	0.76		1.5 % Pb	15+25 W 35+50 N
22	4	0.38			15+50 W 132+00 N
23	4 - sill (top)	0.54			28+50 W 130+00 N
24	8 - quartzite	5.71			4+50 W 123+00 N
25	1 - quartzite	0.61	8.72		25+00 W 129+00 N
26	8 - sill (top)	0.12	0.5	0.20 % Zn 0.005 oz Au	48+50 W 141+50 N
27	14 - stock	0.02	0.38	0.15 % Zn 0.005 oz Au	53+50 W 116+50 N
28	4 - sill	0.24			48+00 W 140+75 N
29	20	1.21	0.24		25+20 W 128+50 N
30	float - limestone	0.10	0.24		49+50 W 119+50 N
31	30 - dyke	0.04	tr	tr Au	51+50 W 113+00 N
32	20 - dyke	0.14	tr	0.25% Zn tr Au	49+50 W 110+00 N
33	14 - sill	nd	nd	0.37 % Zn nd Au	48+75 W 112+00 N
34	18 - sill	0.03	tr	0.10 % Zn tr Au	2 miles WSW Spionkop are
35	8 - sill (centre)	0.11	0.04		49+00 W 141+00 N
36	3.5 - sill (top)	0.82	0.14		48+50 W 140+25 N
37	10 - sill (top)	0.66	0.06		28+75 W 129+50 N
38	8 - sill	0.26	0.02		48+50 W 141+25 N
39	11 - sill (top)	1.07	0.03		23+50 W 131+50 N

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
40	3.5 - sill	0.42	0.06		49+50 W 141+00 N
41	8 - sill	3.45	0.86		3+50 W 123+75 N
42	4 - sill	3.40	0.89		4+25 W 124+00 N
43	3 - quartzite (top)	0.76	0.18		5+50 W 130+75 N
44	8 - sill (base)	3.10			4+00 W 124+00 N
45	4 - sill (base)	0.48			24+25 W 131+80 N
46	8 - sill (top)	5.28			2+60 W 122+50 N
47	15 - sill (top)	1.83	0.69		0+25 E 119+25 N
48	3 - sill (top)	0.28	0.03		10+00 W 130+00 N
49	5 - sill (top)	0.64	0.02		30+50 W 133+00 N
50	7 - sill (top)	0.52	0.031		6+20 W 91+80 N
51	6 - sill (top)	0.68			14+20 W 86 +80 N
52	6 - sill (top)	0.21	0.022		10+00 W 78+50 N
53	4.5 - sill (top)	0.12	0.022		10+00 W 74+50 N
54	2.5 - sill (top)	0.50	0.060		14+50 W 68+75 N
55	4.25 - sill (base)	0.09	0.034		9+50 W 54+00 N
56	3.5 - sill (top)	0.21	0.025		9+40 W 54+00 N
57	9 - sill (top)	0.36	0.037		3+20 W 58+00 N
58	5 - sill (top)	0.61	0.031		3+75 E 55+50 N
59	3 - sill (top)	0.17	0.038		14+00 E 52+00 N

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
60	5 - sill (top)	0.23	0.037		16+50 E 45+50 N
61	12 - sill (top)	0.02	0.036		28+00 E 42+00 N
62	12 - sill (top)	0.02	0.042		18+00 E 14+00 N
63	7 - quartzite	1.76	0.177		16+50 W 56+50 N
64	6 - quartzite (top)	0.15	0.013		16+80 W 62+75 N
65	1 - quartzite	0.07	0.018		26+00 W 67+00 N
66	0.5 - quartzite	0.88	0.124		22+75 W 72+00 N
67	0.67 - quartzite	1.36	0.258		18+00 W 76+00 N
68	2 - quartzite	4.5	0.06		1+25 W 20+60 N
69	float - quartzite	3.8	tr		6+00 E 20+50 N
70	8 - quartzite	3.4	1.6		1+10 E 20+40 N
71	1 - vein	7.2	1.08	tr Au	2+00 W 21+00 N
72	4 - sill (top)	1.25	1.50		16+00 W 2+00 S
73	2 - quartzite	3.91			3+50 W 16+80 N
74	8 - dyke	2.10	0.26		15+00 E 8+00 N
75	0.5 - vein (in dyke)		1.10	tr Au	1+00 W 19+25 N
76	float	3.7	59.38		0+50 W 20+00 N
77	1 - sill (top)	2.8	1.92		0+50 W 20+00 N
78	2 - quartzite	10.3	2.56	0.04	1+20 W 20+50 N
79	100 section of sill		0.96		13+00 W 3+00 S

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
80	8 - sill (base)	0.02	0.56		17+20 E 12+00 N
81	10 - sill	0.02	0.60	0.18 % Zn	36+00 W 64+00 N
82	1.5 - quartz vein	0.58	0.02		15+75 W 35+00 N
83	1 - limestone	0.86		6.26 % Zn 0.04 % Mo	15+75 W 34+00 N
84	6 - quartz vein	0.65	0.62	0.03 oz Au 0.15 % Zn	14+75 W 34+25 N
85	12 - quartzite	2.3	1.36	tr Au	1+25 W 21+75 N
86	8 - quartzite	1.25			0+75 W 21+50 N
87	4 - quartzite	1.3	0.06		5+25 W 19+75 N
88	12 - quartzite	tr			19+50 W 12+00 N
89	7 - quartzite	1.2	0.10		7+75 E 15+50 N
90	4 - quartzite	0.5		tr Zn	7+25 E 16+00 N
91	float - quartzite	2.3			3+00 E 21+ 50 N
92	float - quartzite	2.6	0.42		9+75 W 29+25 N
93	10 - sill		0.4		1+00 W 6+50 N
94	12 - sill (top)	1.66	0.02		1+75 W 11+00 N
95	10 - sill	1.66	tr		0+75 W 12+00 N
96	8 - argillate	1.2			2+00 W 10+75 N
97	0.33 - vein (in sill)	20.82	0.04		1+25 W 11+90 N
98	2 - quartzite	3.36	2.0		1+25 W 20+00 N
99	8 - sill	1.5		0.01 % Zn	8+00 E 15+00 N

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
100	10 - sill	0.06		0.02 % Zn	15+75 E 10+00 N
101	grab - sill		tr	0.015 oz Au	2+00 W 19+75 N
102	14 - stock	0.02	0.25	0.01 oz Au 0.26 % Zn	30+00 W 118+20 N
103	14 - quartzite	6.95	1.3	tr Au	2+50 W 20+75 N
104	10 - quartzite	2.18	0.8		2+00 W 25+50 N
105	6 - quartzite	1.11	0.6		5+00 W 15+00 N
106	20 - sill	0.08	tr		13+25 E 13+00 N
107	20 - sill	0.12	tr	tr Au	9+00 E 11+50 N
108	0.17 - vein (in sill)	20.1		1.0 % Zn	2+75 W 11+80 N
109	0.8 - quartzite	1.20		tr Zn	5+75 W 20+75 N
110	12 - dyke	1.66	0.06		1+35 W 20 + 25 N
111	8 - dyke	0.4			3+00 W 24+00 N
112	8 - sill	0.95			21+75 W 34+50 N
113	10 - sill (middle)		2.22		10+75 W 3+00 S
114	10 - sill (top)	0.55	0.67		16+00 W 4+00 S
115	6 - sill (top)	0.4	0.96		14+00 W 4+75 S
116	5 - sill (top)		0.60		13+25 W 4+75 S
117	2 - dyke	1.26			7+75 E 15+00 N
118	6 - dyke	0.60			7+50 W 48+00 N
119	20 - dyke	0.30			6+00 W 27+00 N

SAMPLE NO.	THICKNESS (ft)	Cu (%)	Ag (oz)	OTHER	COORDINATES
120	11.3 - dyke	0.6			1+75 W 20+75 N
121	12 - dyke	1.1	tr		3+00 W 21+90 N
122	15 - dyke	0.08	tr		8+00 W 27+50 N
123	1 - quartz vein	1.3	0.50	0.01 oz Au 4.3 % Pb	15+75 W 35+25 N
124	grab - sill (middle)			tr Pt	2+50 E 7+50 N
125	grab - sill (middle)			tr Pt	2+50 E 7+60 N
126	float - quartzite	3.36	2.0		9+50 E 23+50 N
127	1 - vein (in dyke)	0.97	tr		8+75 E 14+25 N
128	8 - quartzite	1.47	tr		2+75 W 19+00 N
129	15 - dyke	0.20	tr		3+00 W 22+00 N
130	15 - dyke			0.49 % Zn	38+00 W 62+00 N
131	24 - dyke		0.04	0.15 % Zn	41+00 W 62+50 N
132	15 - dyke	0.61	0.06	0.05 % Zn	40+00 W 63+00 N
133	11 - quartzite	0.60	tr		0+50 W 23+50 N
134	24.9 - quartzite	1.10	tr		1+10 W 22+25 N
135	12 - quartzite	1.10	nd		4+10 W 22+00 N
136	10 - quartzite	1.68			0+75 W 21+00 N
137	3.5 - Quartzite	3.10			0+70 W 20+00 N
138	8 - quartzite	2.70			0+80 W 20+60 N
139	float - quartzite	2.34	0.3		0+75 W 13+20 N