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REPORT

ON

THE 1976 PROSPECTING PROGRAM

UNDERTAKEN BY

KINTLA EXPLORATIONS LIMITED

IN

SOUTHWESTERN ALBERTA

by

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WATERTON PARK, ALBERTA

MAY 1 - JUNE25, 1976.

SUMMARY

This report constitutes a description of the general geologic setting and known metalliferous mineral showings within the Akamina Syncline in southwestern Alberta and southeastern British Columbia as well as a summary of the May 1 to September 30 1976 prospecting program carried out by Kintla Explorations Limited. The information is based on published works and upon exploration carried out in the area by Kintla between 1972 and 1976. The entire area is underlain by Precambrian rocks of the Lewis Series and lies within the Lewis thrust sheet. Strata-bound Cu-Ag mineralization has been found within all areas of the thrust sheet, occurring primarily within the Appekunny, Grinnell, Siyeh, Gateway, and Roosville Formations of the Series. Uranium mineralization has been found in ppm concentrations throughout the Akamina Syncline, and in concentrations of 1/10 pound U_3O_8 per ton in the Appekunny, Grinnell, and locally in the Altyn Formations.

The copper mineralization usually occurs as finely disseminated interstitial bornite - chalcocite - covellite in sandstones and white quartzites, and rarely within argillites and limestones. The uranium mineralization occurs within copper bearing sandstones and quartzites and in the associated argillites. The uranium minerals have not been identified.

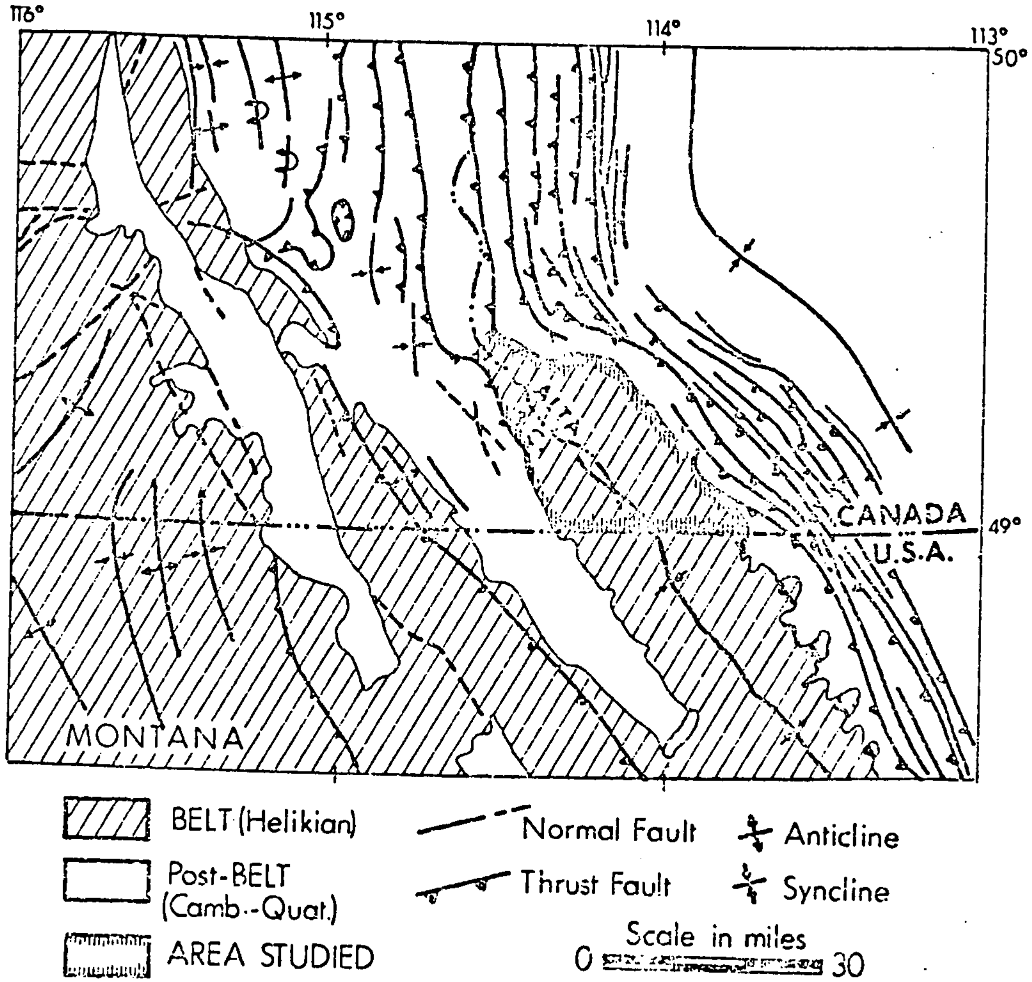

Fig. 1. Tectono-stratigraphic setting of the area discussed in this paper; (after Monger and Preto, 1972)

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LOCATION	West Montana	Southwest Alberta & Southeast B.C.	North Montana
MISSOULA GROUP	McNamara Fm.	Roosville Fm.	Garnet Range Fm.
	Bonner Qtzite	Phillips Fm.	Bonner Qtzite
	Miller Peak Fm.	Gateway Fm.	Mt. Shields Fm
		Sheppard Fm.	Sheppard Fm.
		Purcell Lava	Purcell Lava
		SS	Snowslip Fm
MIDDLE BELT Carbonate	Wallace Fm.	Siyeh Fm.	Helena Dolomites
RAVALLI GROUP	St. Regis Fm. / Spokane Fm.	Werner Peak Fm.	Empire Fm.
		Grinnell Fm.	Spokane Fm.
	Revett Fm.		
	Burke Fm.	Appekunny Fm.	Appekunny Fm.
LOWER BELT	Prichard Fm.	Altyn Fm.	Altyn Fm.
		Waterton & Fort Steele Fm.	Waterton Fm.
	Base – not – exposed		
PRE-BELT Crystalline Rocks		Aphebian (?)	

Fig. 2. Correlation chart for Belt Supergroup rocks of SW. Canada and NW. United States; (after Harrison, 1972)

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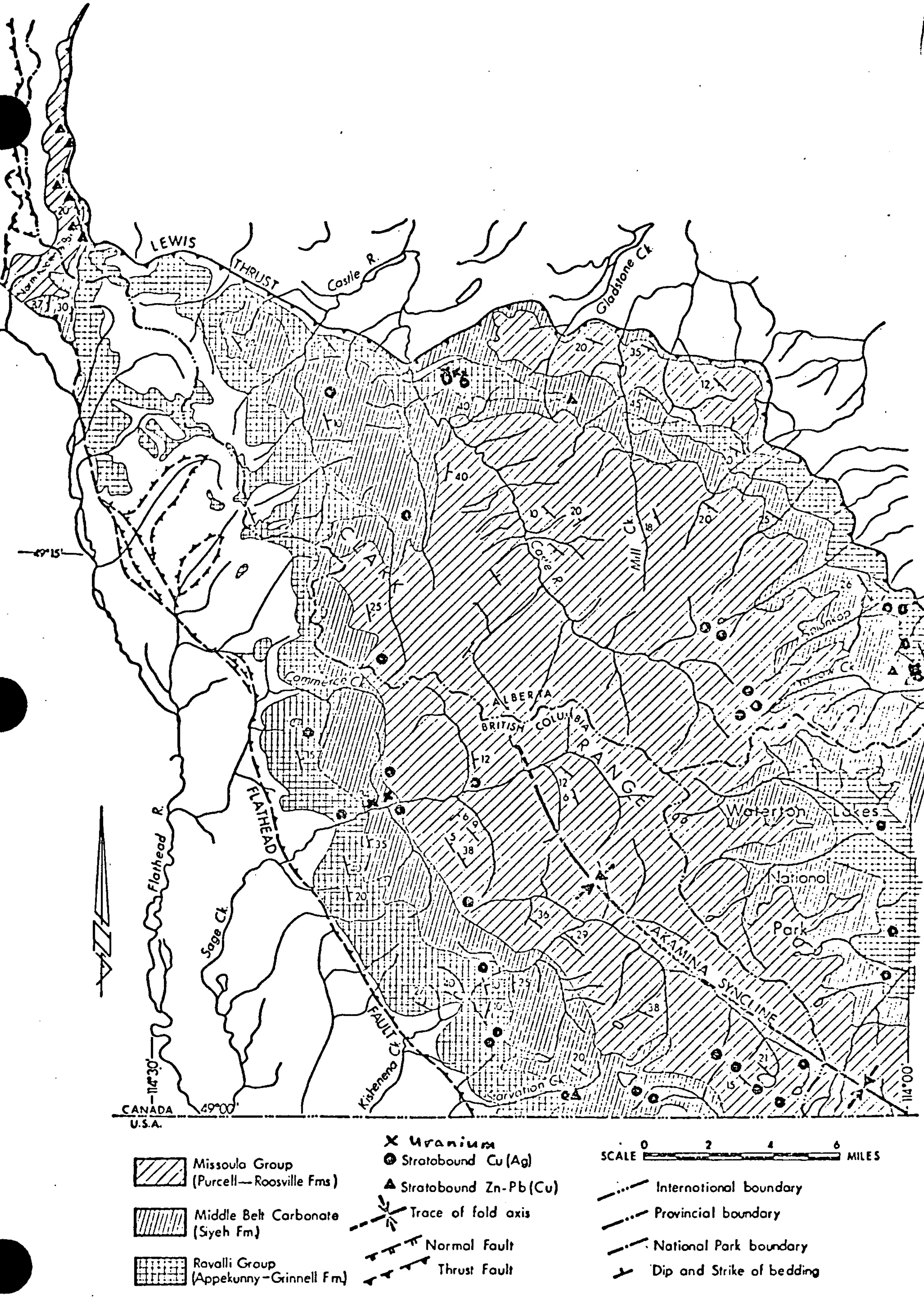

Fig. 3. Geological Sketh Map of Clark Range and locations of principal stratabound Cu (Ag) and Zn/Pb (Cu) occurences discussed.

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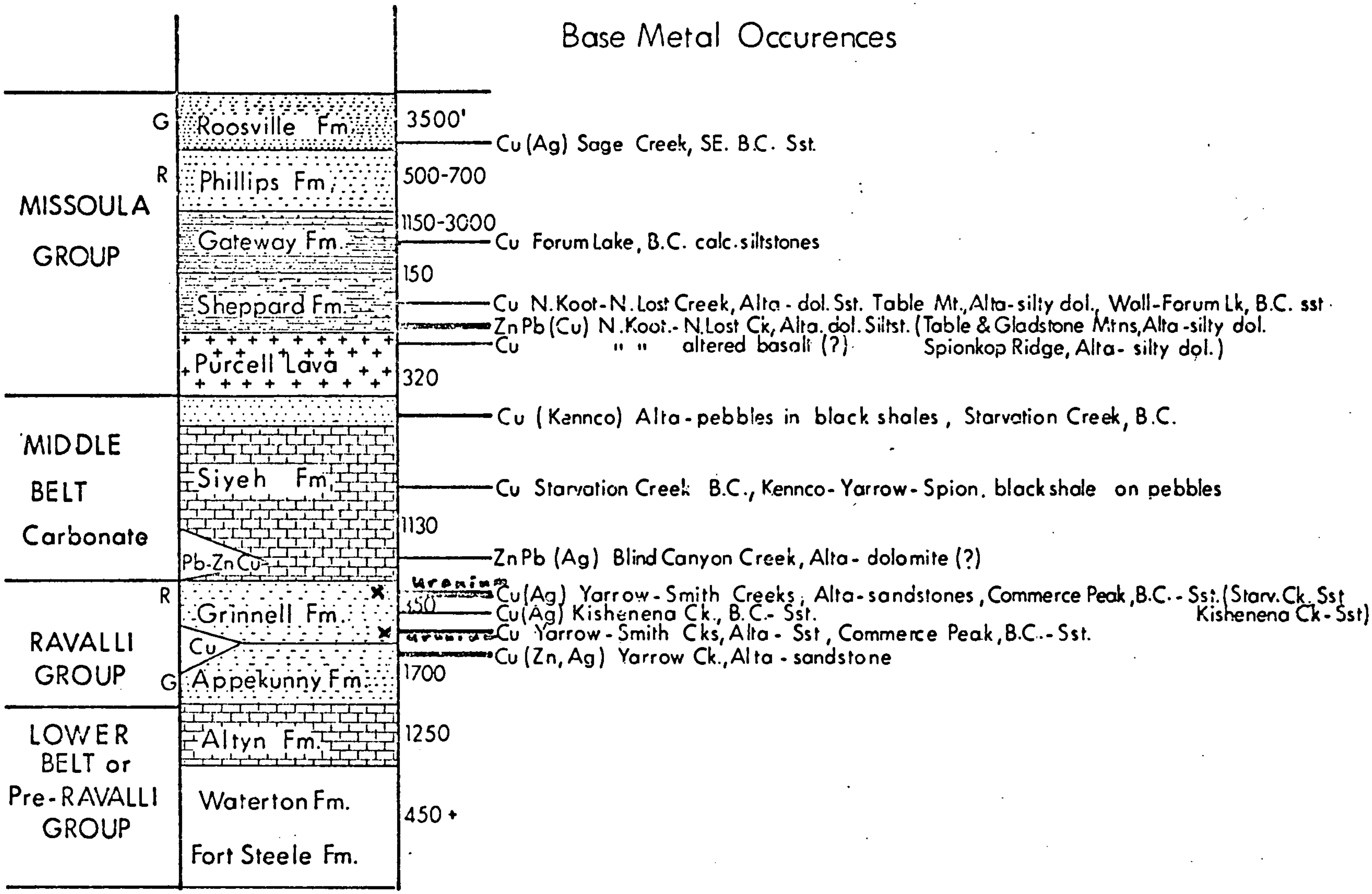

Fig. 4.

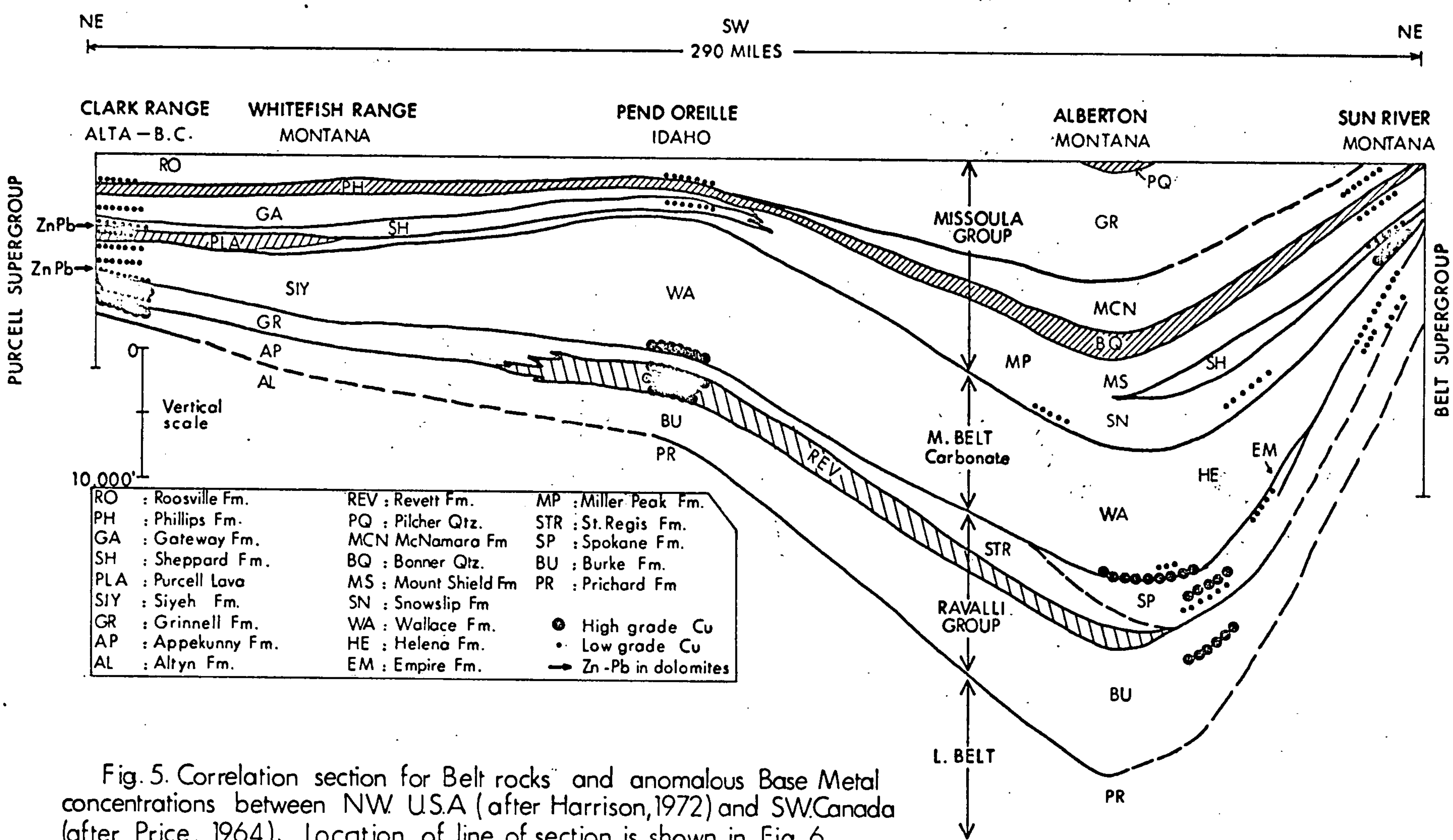

Fig. 5. Correlation section for Belt rocks and anomalous Base Metal concentrations between NW U.S.A (after Harrison, 1972) and SW Canada (after Price, 1964). Location of line of section is shown in Fig. 6.

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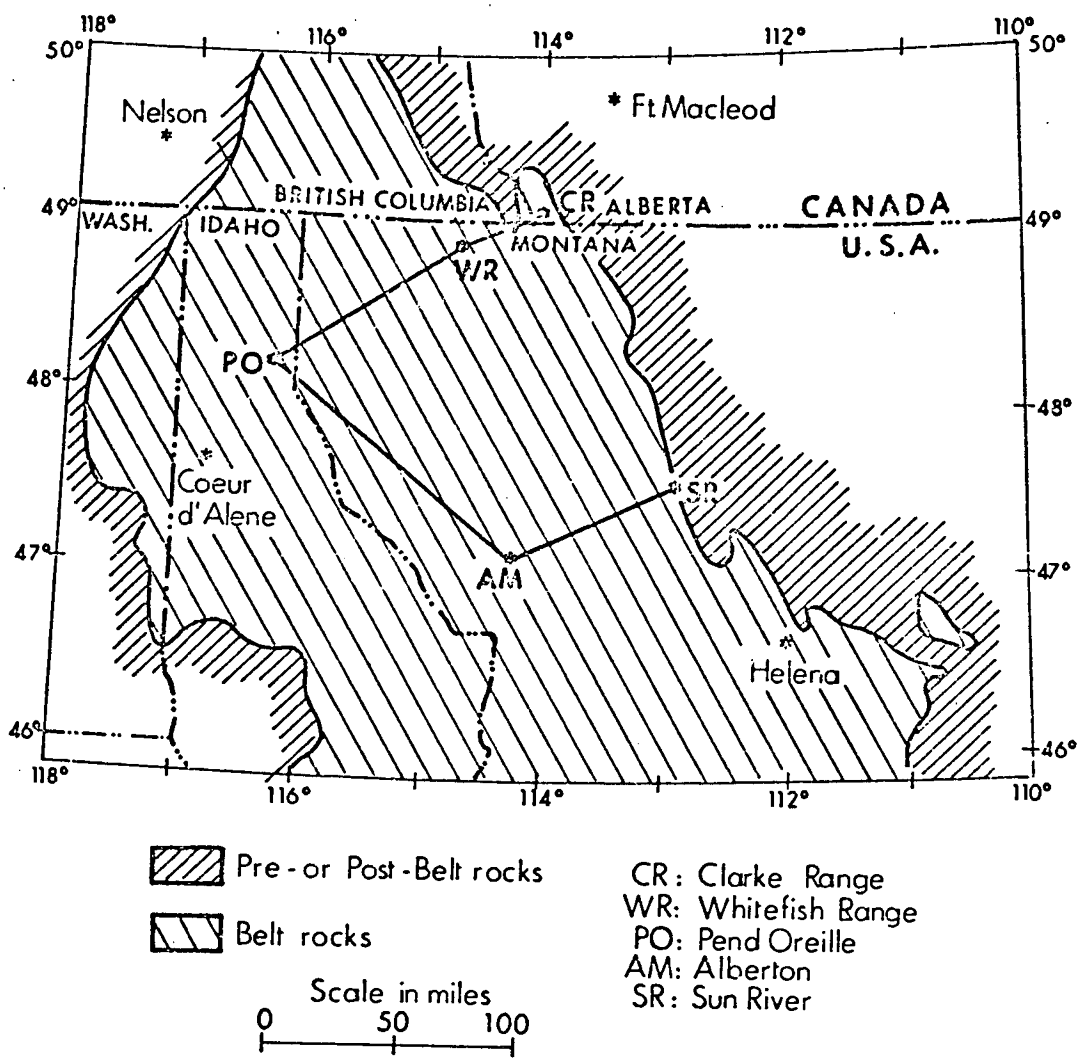

Fig. 6. Approximate distribution of Belt rocks in NW. USA. and Canada with line of section of Fig. 5.

PHYSIOGRAPHY OF THE REGION

The Akamina Syncline is located in an area of mountainous terrain characteristic of the Lewis Range of the southern Rockies. The relief is rugged with the altitudes generally varying between 4,000 feet and 6,500 feet above sea level, with ridges and peaks reaching between 6,500 feet and 8,500 feet above sea level. The area is heavily forested on the lower slopes with Lodgepole pine, White spruce, and Engelmann spruce predominant. The higher slopes where the mineralization is concentrated are typical Alpine meadows with small stands of coniferous trees wherever shelter permits.

The mean January temperature of the area at the 4,000 foot level is 16^{o} to 32^{o} F, and the mean July temperature is 62^{o} to 72^{o} F. The area experiences a mean annual precipitation of 24" and a considerable portion of this falls as in excess of 6.5' of snow.

Access to the Akamina Syncline is excellent via forestry and seismic roads along most of the valleys.

REGIONAL GEOLOGICAL AND TECTONIC SETTING

The Lewis Series and its equivalent, the Purcell Supergroup, is exposed in Canada south of latitude 51^{o} North in three major tectonic units, the Purcell Arch, the western Rocky Mountain fault complex, and the Lewis thrust sheet (Burwash, 1968). The Lewis Series outcrops within the Lewis thrust sheet, which is a plate 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. (1957) concluded that the most dominant of the folds, the Akamina Syncline, parallels the Purcell anticlinorium, formed west of the Rocky Mountain Trench. Hume (1932) concluded 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. This appears to be a listric normal fault formed after emplacement of the Lewis overthrust by back-slippage along a pre-existing thrust during a phase of post-orogenic uplifting. The thrusting and subsequent normal faulting is part of the Laramide orogeny of the Middle Paleocene and Eocene. Movement on the Flathead fault is believed to have continued well into the Oligocene.

Regional metamorphism within the Lewis thrust sheet is of low grade. In the western Rockies this metamorphism is near the transition from the quartz-albite-epidote-biotite subfacies to the quartz- albite- epidote- almandine subfacies of the greenschist facies. This metamorphism occurred during the East Kootenay orogen at approximately 750 million years ago.

STRATIGRAPHY

The rocks of the Lewis thrust sheet belong to the Precambrian Lewis Series and its equivalents, the Purcell and Belt Supergroups. These rocks are mainly shallow water, sub-

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±
			PHILLIPS FORMATION	Red sandstone, siltstone, argillite	500- 700
			GATEWAY FORMATION (upper member)	Argillite, argillaceous siltstone, dolomite dolomitic sandstone, and argillite	1150-3000
			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+

Table 1. Stratigraphic succession of SW Canadian Precambrian (after Price 1952)

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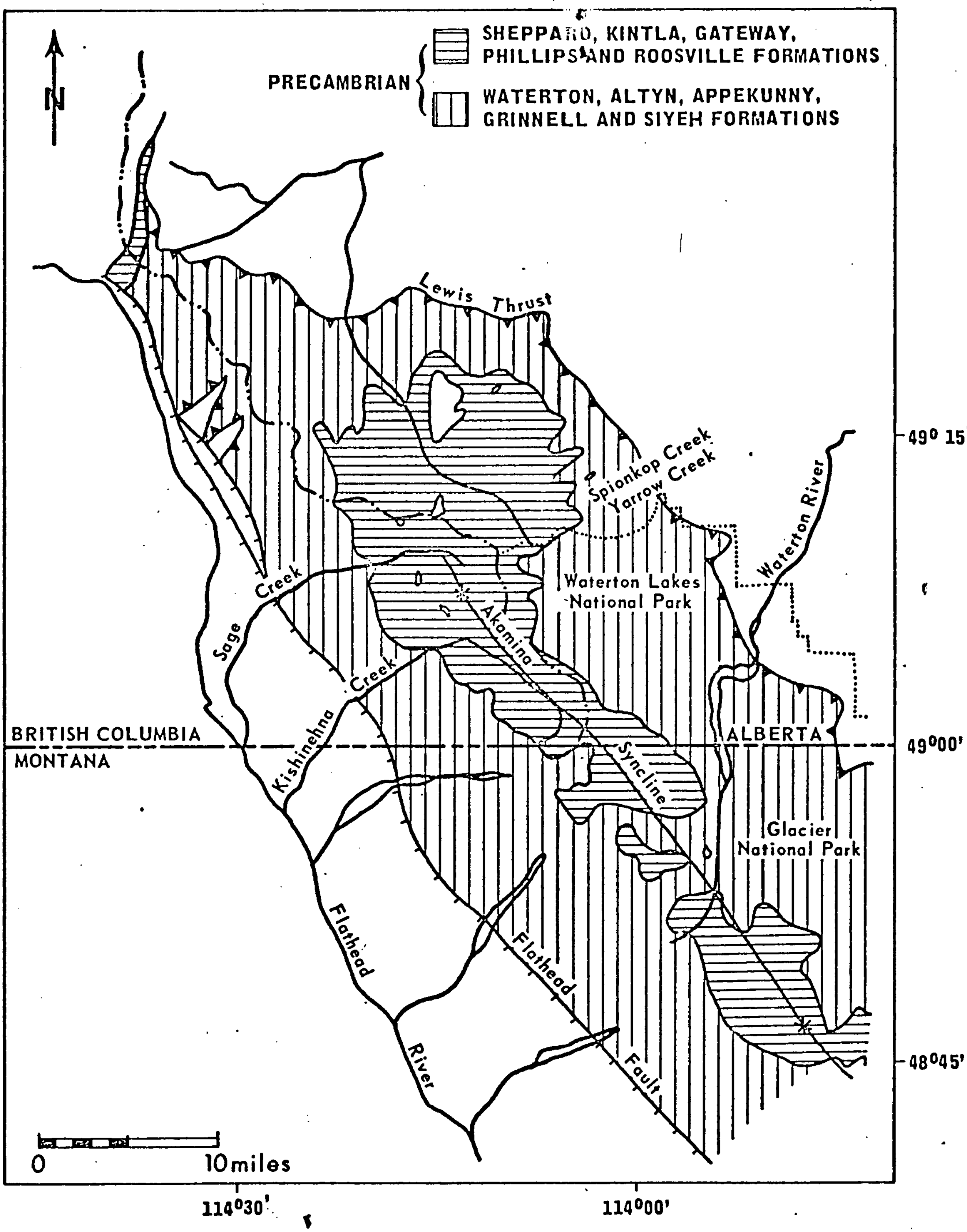

FIG.8. Sketch Map of the Regional Geology of the Lewis Thrust Sheet (after Price 1965)

aerial and marine quartzites, argillites, and carbonates with minor submarine lava flows and deeper water sediments. The stratigraphic succession as given by Price (1962) is shown in Table 1. The formations of primary interest in the prospecting program, the Appekunny and Grinnell Formations, were defined by Fenton and Fenton in 1937 as follows:

<u>APPEKUNNY FORMATION</u> - argillite, interbedded with quartzite, conglomerate, and minor beds of argillaceous limestone; prevailingly green, greenish-grey to brownish, with some dull red, white, and purplish beds. Thin-bedded to thick-bedded, with fine laminae; massive only in quartz conglomerates and quartzites. Grades into adjacent formations.

<u>GRINNELL FORMATION</u> - red or purplish argillites and white to light green quartzites, lying between the Appekunny and the succeeding Piegan Group. Textures, colors, and bedding are highly variable; ripple marks, mud cracks, and current marks are abundant, as are rain or hail prints in some members.

It is possible that the Appekunny and Grinnell Formations are differently coloured phases of one formation, with the line of distinction between them oblique to the stratification.

The western boundary of the Rocky Mountain Trench approximates the western limit of Grinnell-type sediments except where modified by local embayments. A northeastern iron-rich source area was subjected to subaerial erosion, and hematite formed during deposition produced the colour of the Grinnell strata. The green colour of the Appekunny strata probably represents the reduction of ferric iron to ferrous iron after submarine deposition. The source area for the Siyeh was apparently to the southeast, at least for the Yarrow Creek area of southwestern Alberta. The source rocks were low-lying fine grained, low-grade metamorphic schists and phyllites essentially composed of quartz and fine-grained micas.

Deposition of the Appekunny and Grinnell Formations must have taken place about1300 million years ago as the over-lying and underlying formations have been dated at 1315 $\pm$ 35 million years. The Purcell Lava dates at approximately 1100 million years, and the underlying basement dates at between 1600 and 1850 million years ago.

There are two recognized cycles of deposition in the Belt Supergroup of Montana, the Pre-Ravalli and the Ravalli, and the Piegan - Missoulan Groups. The Sheppard Formation forms a third, minor cycle. Each cycle is characterized by deep, followed by shallow water, deposition. This gives rise to two contrasting fine grained rock types in each cycle, first, a black to gray carbonaceous siltite, thickest near the axis of the depositional trough, commonly very fine and evenly laminated and lacking mud-cracks, intraformational mud chip conglomerates or abundant stromatolites. Carbonate is present as calcite. The second rock type of each cycle is a reddish hematite bearing siltite, thickest on the basin margins,with laminated sediments with abundant mud cracks and intraformational mud chip conglomerates. This second type commonly passes laterally into greenish siltite towards the axis of the depositional trough. Carbonate is usually abundant in the form of dolomite.

The Appekunny and Grinnell Formations belong to this second, shallow water type. The transition from the first to the second cycle of deposition takes place at the Grinnell - Siyeh Formational contact.

The Lewis Series sediments were deposited in a slowly subsiding basin or trough of high stability. The rate of deposition kept close pace to the rate of subsidence of the basin, with some areas exposed to subaerial conditions for short periods of time. These conditions of deposition were on a large subsiding delta or on or near to the flood plain of such a delta. Most of the ripple marks in the Grinnell and Appekunny Formations are of the symmetrical wave type, and this indicates that the deposition took place under fresh water. The presence of salt crystal casts within the Kintla Formation and much less abundantly near the base of the Appekunny indicates that at least some of the deposition took place in brackish or salt water.

STRUCTURE

Price outlined two distinct groups of structures in his 1962 paper on the Lewis Series. The first of these, a series of thrust faults and related folds, is generally cut by the second, a group of younger, normal faults. This apparently represents late Mesozoic and early Tertiary normal thrusting followed by late Tertiary normal faulting. The normal faults, although steep at the surface, flatten at depth, and appear to merge with older thrust faults. A third set of northeasterly trending transverse faults also occurs within the Clark Range. These likely originated as gravity faults whose orientations were controlled by the anisotropy of the basement rocks underlying the region.

IGNEOUS ACTIVITY

Igneous activity within the Lewis Thrust Sheet was of three types. The first of these is typified by the Moyie-type intrusives of Precambrian age characterized by chloritized diorite and diabase sills and dykes concentrated within the Altyn Appekunny, Grinnell, and Siyeh Formations, and occasionally within the Kintla Formation. The second type of igneous activity is the Purcell volcanics, andesitic lavas belonging to the trachybasalt family. The third type of igneous activity was the intrusion of leucocratic alkalic intrusives of Cretaceous and Tertiary age.

METALLIFEROUS DEPOSITS

Dawson first reported the occurrence of copper mineralization in the North Kootenaly Pass area in 1886. The mineralization was in the form of diseminated chalcopyrite in the Purcell Lavas and diabase dykes. Exploration in Glacier National Park, Montana, in the late 1880's and early 1890's was centered upon copper and lead deposites near the head of Quartz and Mineral Creeks. During the period from 1900 to 1910 small scale mining was undertaken on Coppermine Creek in what is now Waterton Lakes National Park in Alberta, where a chalcopyrite vein within a diabase dyke at the top of the Appekunny Formation was mined for a short distance down dip. During the period 1910 to 1920 copper-silver mineralization was located north of Waterton on the north side of Yarrow Creek. During the 1930's gold was located on the eastern end of Commerce Mountain in the extreme southeastern portion of British Columbia, and the area was staked numerous time after that, most recently in 1967 by Kennco Explorations Limited who subsequently turned the property over to the Goble family of Waterton Park and who in turn sold the property to Kintla Explorations Limited. In 1967 Kennco discovered several thin, high grade beds of copper-silver-lead bearing quartzite in the area where the gold values had earlier been obtained. Exploration activity on the Alberta side of the syncline recommenced in 1962-63 with the staking of the initial mineral claims on the Yarrow Creek - Spionkop Creek copper - silver deposits. Subsequent exploration by numerous companies including Falconbridge Nickel Mines Ltd., Cominco Ltd., Alcor Ltd., Denison Mines Limited, and Kintla Explorations Limited, among others resulted in the discovery of sedimentary copper - silver mineralization throughout the syncline, principally in the Grinnell and Appekunny Formations, and the discovery of sedimentary lead - zinc - silver - molybdenum mineralization in the North Kootenay Pass area in the Sheppard Formation. In 1975 a prospecting program carried out by Kintla Explorations Limited indicated the presence of uranium in the syncline, and in at least the Yarrow Creek area, of high enough grade to warrant further examination.

1976 PROSPECTING PROGRAM

The 1976 prospecting program commenced May 1, 1976 and concluded September 30, 1976, comprising 137 traverses of which 119 were on the Big Horn group of mineral claims, and 18 traverses were in the immediate area, but off the claims. The main area of interest was the south ridge of Spionkop Ridge immediately north of Yarrow Creek in the area previously thought to contain only copper - silver - lead - zinc mineralization. Numerous ppm concentrations of U_3O_8 were located throughout the mineral claim group, but the richest deposit of U_3O_8 was found on the southern face of the southernmost ridge approximately one-half mile north of Yarrow Creek. The mineralization occurs within a series of 1 to 6 foot thick sandy quartzite beds approximately 100 feet below the Grinnell - Siyeh formational contact and 225 feetsoutheast of Kennco Explorations (Western) Limited's deep diamond drill hole drilled in 1967.

The uranium appears to be in the form of disseminated pitchblende and carnotite, and ranges up to 4.812 pounds of U_3O_8 per ton. The deposit appears to be of the roll-front type similar to those of southeastern Utah and northern Arizona. If this is the case, numerous other roll-front orebodies are likely concentrically oriented around the probable source of the intrusive fluids, the locus of dioritic intrusives approximately one-third of a mile north of the showing. The quartzite beds are well mineralized with copper, averaging 2.13% Cu and 0.52 oz. per ton silver. Other beds are mineralized in the area as slumped blocks of similarly mineralized quarzite were found.

The assay results together with the sample locations, widths, formations, and rock types are presented in table form at the end of this report. The details of the sections completed are presented following the assays.

CONCLUSIONS

The uranium mineralization found to date suggests that the Grinnell Formation quartzite units are the most favourable areas for prospecting for uranium, particularly wherever these units contain appreciable amounts of copper and silver. The occurrence of quartzite units in the Grinnell Formation with the double association of copper - silver mineralization and dioritic intrusives apparently provides the most favourable location for deposition of uranium in the area. The known occurrences of copper - silver mineralized quartzites in the Grinnell Formation should be prospected immediately, and the well examined deposit on the southern flank of Spionkop Ridge should be drilled to establish dimensions and any changes of grade at depth.

The Siyeh, Purcell Lava, Phillips, Gateway, and Roosville Formations do not appear to have appreciable concentrations of uranium and need not be extensively examined in the future. Further work should be done on the uppermost Grinnell Formation quartzites in the northern half of the Blind Canyon, north of Yarrow Creek on the eastern face of Spionkop Ridge. The grades of uranium mineralization discovered on the Big Horn Claims in southwestern Alberta fully warrant the investment of considerable capital to delineate the boundaries of the deposit.

Sample No.	Rock type	Formation	Width	Location
10234	red siltstone	Phillips	10'	N. Kootenay Pass
10235	red argillite	Grinnell	6'	Yarrow
10236	red argillite	Grinnell	4'	Yarrow
10237	grey sandstone	upper Grinnell	4'	Yarrow
10238	green argillite	Altyn	6'	Yarrow
10239	green argillite	upper Grinnell	6'	Spionkop
10240	red argillite	lower Grinnell	6'	Yarrow
10241	green argillite	upper Grinnell	4'	Yarrow
10242	green argillite	upper Grinnell	4'	Yarrow
10243	grey quartzite	upper Grinnell	5'	Yarrow
10244	grey quartzite	upper Grinnell	6'	Yarrow
10245	red argillite	upper Grinnell	5'	Yarrow
10246	grey quartzite	upper Grinnell	4'	Yarrow
10247	grey sandstone	upper Grinnell	4'	Yarrow
10248	grey sandstone	upper Grinnell	5'	Yarrow
10249	grey quartzite	upper Grinnell	3'	Yarrow
10250	diabase sill	lower Grinnell	9'	Yarrow
10451	green argillite	middle Appekunny	8'	Smith Creek
10452	grey - green sandstone, green argillite	middle Appekunny	10	Smith Creek
10453	red argillite	lower Grinnell	10'	Smith Creek
10454	grey quartzite	upper Grinnell	8'	Blind Canyon
10455	grey quartzite	lower Grinnell	6'	Sage Creek
10456	green argillite	upper Grinnell	10'	Blind Canyon

10457	green argillite	upper Grinnell	10'	Blind Canyon
10458	green argillite	upper Grinnell	8'	Smith Creek
10459	grey quartzite	middle Grinnell	6'	Yarrow
10460	grey quartzite	lower Grinnell	4'	Yarrow
10461	green quartzite	upper Grinnell	6'	Yarrow
10462	grey quartzite	upper Grinnell	4'	Yarrow
10463	grey quartzite	lower Grinnell	7'	Whistler
10464	red argillite	lower Grinnell	7'	Whistler
10465	grey quartzite	upper Grinnell	6'	Yarrow
10466	red argillite	upper Grinnell	5'	Blind Canyon
10467	red argillite	lower Grinnell	8'	Blind Canyon
10468	black siltstone	Sheppard	6'	South Lost
10469	black siltstone	Sheppard	6'	West Yarrow
10470	Black Siltstone	Sheppard	6'	West Yarrow
10471	red siltstone	Sheppard	6'	West Yarrow.

Yarrow Creek, Appekunny Formation, Continued:

2' - Buff sandstone	45	
14'- Green argillite with some rusty zones up to 1' thick	85 - 95	
4' - Rusty argillite	95	
15'- Green argillite and minor quartzite	70	
42'- Red and green argillites, minor 2-4" rusty zones, 1-2" quartzites every 1-2' feet	75 - 85	
5' - Green quartzite	45 - 50	
14'- Rusty green argillites	75 - 85	
20'- Banded purple/green argillite	60 - 70	
2' - Layered quartzite	50	
85'- Rusty banded green argillite	65 - 70	
60'- Rusty banded green argillites interlayered every 2-3 feet with 4-6" quartzites	35 - 60	
15'- Buff sandy cross bedded sandstone	35 - 40	
25'- Purple sandy argillite	40	
10'- Green/buff quartzite	45	
6' - Buff weathering 2-4" thick layered quartzite	70 - 95	
4' - Rosy argillite with minor sandstone	50	
3' - Purple/green argillite	70	
6' - Green argillite	70 - 75	
4' - sandstone	45	
10'- Purple argillite	60	
3' - Brown quartzite	60	
20'- Purple/green argillite	60 - 65	
25'- Light green argillite	55 - 65	
150'-Interbedded red/green argillite	70	
8' - Lithic quartzite	45	
70'- Green argillite	70	
15'- Rusty siltstone	55 - 60	
60'- Green siltstone/argillites	70 - 120	
10'- Red argillite	70	

Altyn Formation (continuous section from Appekunny)

50'- Grey-green shale	50 - 60	
with interbedded 6-8" sandstone	50	
35'- Buff weathering dolomite, dominant cliffs	60 - 70	
30'- Dolomitic siltstone, recessive unit	70 - 80	
8' - Buff weathering siltstone, dominant	90 - 100	
4' - Dark brown silty dolomite	90	
15'- Interbedded green siltstone and minor argillite	100 - 130	
1' - Buff siltstone	100	
30'- Green argillite	120 - 130	
3' - Siltstone	100	
1' - Stromatoporoid unit	120	
10'- Grey shale	100	
5' - Siltsone, light brown	120	SAMPLE TAKEN
3' - Buff weathering stromatoporoid unit	120	
175'-Shale unit, readings every 5 feet	120	
	120	
	110	

Altyn Formation, Yarrow Creek, continued.

	120	
	110	
	195	SAMPLE TAKEN
	170	
	180	
	170	
	160	
	180	
	170	
	90	
	100	
	140	
	130	
	120	
	120	
	110	
	130	
	130	
	120	
	130	
	100	
	140	
	110	
	110	
	140	
	150	
	100	
	110	
	135	
	100	
	100	
5' - Thinnly bedded light green shale	100	
14'- Light green dolomite unit	60 - 90	
8' - Light green shale	100 - 120	
5' - Rusty sandstone	140 - 150	
50'- Sandy solomite	70	
125'-Grey/green shale	100 - 150	
6' - Lithic quartzite	80	
1' - Limey shale	90	
2' - Buff weathering sandy dolomite	70	
8" - Hard quartzite	80	
2' - Shale interlayered with dolomite	80	
14'- Buff weathering dolomitic sandstone	50	
5' - dolomitic sandstone	50	
2' - Green shale	150	
15'-Dominant Dolomite	70 - 80	
5' - Stromatoporoid unit	80	
2.5'-Light green shale	85	

Altyn Formation, Yarrow Creek, continued

6" - Coarse grained sandstone	125	
4' - Grey/green shale	80	
16'- Grey quartzite, minor iron staining	85 - 120	

Overburden---

Grinnell Formation, Carpenter Creek, Alberta **(South Drywood Creek)**

Grinnell, from top:

		CPS
15'	Red, cross bedded Quartzite Trace Cu in lower 4 feet	45 - 50
12'	Red, cross bedded quartzite	50 - 60
4'	Red argillite	80
2'	Quartzite	60
4'	Red argillite	80
2'	Red cross bedded quartzite	55 - 70
4'	Red argillite	85 - 90
8'	Sandy quartzite	70
10'	Red argillite	85 - 100
40'	Red quartzite, minor interbedded red argillite	60 - 70
1'	Red argillite	90
2'	Red quartzite, minor interbedded red argillite	70
2'	Red argillite	90
2'	White quartzite	70
4'	red argillite	85 - 90
12'	White quartzite	60
5'	Red argillite	90 - 100
18'	Interbedded red argillites and red quartzites	70 - 90
2'	Red argillite	85 - 90
3'	Hematitic quartzite	70
8'	Red argillite	100
4'	Red quartzite, limey	70
3'	Red argillite	90
2½'	Red banded quartzite	80
4'	Red Argillite	100
1'	White quartzite	70
2'	Red Argillite	85
1'	Quartzite	70
2'	Red argillite	90
2'	Quartzite	70
14'	Red siltstone	60 - 70
2'	Red argillite	100
12'	Red siltstone	60 - 70
3'	White quartzite	60
4'	Recessive red siltstone	60
4'	Hematitic quartzite	60
4'	Red argillite	80
15'	White quartzite	60 - 80
10'	Interbanded red argillite and quartzite	70 - 80
12'	Red argillite	100
4'	Quartzite	50 - 60
2'	Red quartzite	80
6'	Red argillite	90
2'	Quartzite	70
2'	Red argillite	100
8'	Red quartzite	80
4'	Red argillite	110
2'	Interbedded red argillites and quartzites	80
3'	Red argillite	100
1'	Quartzite	100

Yarrow Creek, Alberta:

Grinnell Formation

	CPS	
3' - Hard white quartzite, minor chalcopyrite	45	
18' - Interbedded red argillites	80	
and sugary quartzites, some thucholite, minor copper mineralization	45 - 55	
4' - Buff weathering sugary quartzite, 1.0 to 2.0 % copper as chalcopyrite	50	
2' - Red/green argillite with minor quartzite layers	85 - 100	
4-5' - Buff weathering/grey quartzite, chalcocite, bornite, minor chalcopyrite, some hematite	500 - 600	SAMPLES TAKEN
42' - Interbedded red argillites	90 - 135	
and copper bearing sugary quartzites (cp)	45 - 60	
14' - Diorite dyke (30° to bedding), minor bornite and chalcopyrite	35	
9' - Hard white quartzite, interlayered green argillite bands	55 - 60	
90' - Red argillites with 6 to 8 inch layers of	95 - 105	
hard white quartzite every 10 to 15 feet.	45 - 55	
105' - Red argillite, minor green argillite layers 1 to 2 inches thick, 15-25 cps higher.	35 - 55	
6' - Diorite dyke, (25° to bedding) minor chalcopyrite, hematite veining	40	
1' - Sugary quartzite, bornite and chalcopyrite	85 - 95	
83' - Red argillite	60 - 75	

Appekunny Formation (continuous section from Grinnell)

10' - Buff / green fine grained quartzite, 2-5 mm. pyrite crystals, 0.5 to 1.0 % copper as cp.	60 - 65
60' - Diorite sill, minor epidote, arsenopyrite	40 - 45
85' - Lithic quartzite, green weathering, numerous mud cracks, minor interbedded shale	40 - 50
1' - Red argillite	60 - 70
4' - Green argillite	60
1' - Lithic quartzite	50
20' - Green argillite - top 8' -	50
next 12' -	80 - 90
1' - Green siltstone	50
50' - Red argillite	50 - 55
22' - Green argillite	55
2' - Rusty green argillite	70 - 75
6" - Buff weathering quartzite, ripple marks	55
2.5' - Green argillite	60
5' - Red argillite	85 - 95
16' - Purple hematitic quartzite, interlayered with green argillite	70
1' - Buff weathering pyritic siltstone	65
18' - Interbedded green and purple argillites	60 -65
2' - Rusty green argillite	60
4' - Sugary quartzite/green argillite/siltstone	65 - 70
23' - Green argillite	70
2-4" rusty patches	85 - 95
8' - Red argillite	65

Grinnell, continued:

225'	- Red argillite, minor (4-5%) thin white quartzites	95 - 100

Appekunny Formation, continuous section from Grinnell:

34'	- Red siltstone, minor sandstone layers sandstone	80 - 85 60
4'	- Buff weathering siltstone	60
2'	- Red argillite	80
5'	- Green argillite/siltstone	80
20'	- Red argillite	100
4'	- Interbedded red argillite and quartzite	100
25'	- Interbedded green siltstone, argillites, quartzites, sample taken of copper in central quartzite.	120 - 140
30'	- Interbedded purple and green argillites (80:20)	80 - 100
26'	- Green argillite	90
20'	- Interbedded purple and green argillites 2-4" layers	90 - 100
60'	- Green argillite with minor rusty zones	100 - 110
20'	- Purple argillite with minor buff weathering siltstone bands	80 - 90
6'	- Siltstone	60
85'	- Green argillite	80 - 100
8'	- Light green argillite	80 - 100
4'	- Rusty green argillite	110 - 125
7'	- White quartzite with green argillaceous pebbles, minor replacement of pebbles by chalcopyrite	50
6'	- Green argillite	100
2'	- Dolomitic sandstone	70
4'	- Purple and buff argillite	80 - 90
4'	- Grey and purple quartzite	70
6'	- Purple argillite	80 - 100
4'	Friable layered sandstone	50
1'	- Grey quartzite	50
4'	- Light green argillite with minor sandstone layers	110 80
5'	- Rusty green argillite	100
6'	- Cross bedded interlayered siltstone and argillite, cliff forming unit	50
4'	- Purple argillite	80 - 90
4'	- Purple mud cracked quartzite/argillite	50
5'	- interbedded purple argillite and siltstone	80 50
3'	- Crossbedded buff sandstone	50
3'	- Green and purple argillite	80
5'	- Buf siltstone	50
14'	- Buff weathering sandstone	60
4'	- Grey/green siltstone	100
1½'	- Cross bedded rosy quartzite	50
1'	- Cross bedded buf sandstone, recessive	70

Appekunny, continued:

3'	- Red argillite	80
6'	- Buff weathering dolomitic sandstone	50
7½'	- Light green argillite	80
2'	- Buff weathering siltstone, cliff forming minor copper	70 - 80
7'	- Red and buff argillaceous siltstone	80
1'	- Siltstone	80
4'	- Red argillite	110 - 130
2½'	- Cross bedded purple quartzite	70 - 90
2'	- Red argillite	80
6"	- Brown sandstone	70
1'	- Red argillite, minor ½-1" white quartzites	70
2½'	- Sandstone	60
5'	- Light blue argillite	100
4'	- Buff weathering sandstone	70
14'	- Red argillite	90 - 100
10'	- Rusty green argillite	100 - 110
24'	- Green argillite	90 - 100
3'	- Green argillite with interbedded green/white quartzite	80 - 90
4'	- Green/purple siltstone	100 - 110
2½'	- Purple/grey quartzite	50
1'	- Green layered sandstone	50
1'	- Buff sandstone	50
2'	- Cross bedded quartzite	70
4'	- Red and green argillite	80 - 100
3'	- Buff siltstone	50
1½'	- Red siltstone	70
2½'	- Buff siltstone	70
4'	- Buff/red siltstone	70
1'	- Grey argillite	60
1'	- Brown argillite	80
1'	- Red argillite	100
6"	- Green argillite	80
2'	- Red argillite	90
6"	- Brown argillite	80
1'	- Red argillite	90
6"	- Buff argillite	60
1½'	- Green argillite	100
2'	- Dominant purple sandstone	70
2'	- Light green argillite	100
6'	- Brown quartzite	70
14'	- Rusty green shale	120 - 140 SAMPLED
2'	- Silty dolomite	80
10'	- Shale, red/green	70
12'	- Green/brown argillite	60
22'	- Buff weathering dolomitic siltstone	60
18'	- Light grey/green silty quartzite	70
85'	- Green argillaceous siltstone	90 - 110

Roosville Formation, La Coullotte Ridge, British Columbia:

From top:		CPS	
165'	- Red and buff weathering sitstone	70	
24'	- Grey syenite	65 - 70	
105'	- Buff weathering green siltstone	70	
10'	- Rose weathering siltstone and argillite	60	
75'	- Buff weathering green siltstone	60	
60'	- Buff weathering green argillite	70	
28'	- Red argillite with red cherty layers	75	
175'	- Green argillite with cherty layers	70	
30'	- Stromatoporoid layers with interbedded green argillite and chert	70	
45'	- Green argillite	70	
16'	- Diabase	65	
225'	- Green argillite and siltstone	80 - 85	
72'	- Siltstone	90	
11'	- Diabase	65 - 70	
195'	- Buff/green argillite	90	
15'	- Diabase	50	
85'	- Green argillite	70 - 80	
15'	- Diabase	50 - 55	
85'	- Green argillite	80 - 85	
175'	- Green argillite and siltstone	80 - 85	
10'	- Buff weathering sandstone	70	
30'	- Green argillite	90 - 95	
85'	- Green siltstone	75 - 90	Roosvile
60'	- Red siltstone	90 - 100	Phillips
4'	- Buff argillite	120	
45'	- Red siltstone	95	
10'	- Green siltstone	110	
40'	- Red siltstone	100	
8'	- Green argillite	80	
5'	- Red siltstone	80	
12'	- Red argillite	85 - 100	
10'	- Red siltstone	110	
1'	- Green argillite	100	
5'	- Red siltstone	100	
1'	- Red argillite	95	
3'	- Red siltstone	90 - 95	
1'	- Red argillite	105	
1'	- Green siltstone	90 - 100	
1'	- Red argillite	120	
4'	- Rose argillaceous siltstone	85	
8'	- Green argillite	95	
2'	- Siltstone	80	
6'	- Green argillite	105	
8'	- Rose argillite	100	
2'	- Siltstone	80	
2'	- Green argillite	85	
8'	- Rose argillite	100	
1½'	- Green argillite	80	
5'	- Rose argillite	80	

Phillips continued

1'	- Buff argillite	105	
5'	- Green argillite	95 - 100	
3'	- Rose argillite	90	
4'	- Green argillite	120	
3'	- Rose argillite	90	
2'	- Green argillite	105	Phillips
2'	- Quartzite	70	Gateway
4'	- Green argillite	80	
5'	- Brown/purple quartzite	80	
5'	- Argillaceous siltstone	100	
3'	-- Buff/purple quartzite	80	
22'	- Massive siltstone	75 - 80	
1½'	- Friable siltstone	60	
15'	- Massive siltstone	75 - 80	
85'	- Interbedded siltstone and argillite	80 - 95	
10'	- Pink quartzite	55 - 65	
8'	- Interbedded siltstone and argillite	95 - 105	
12'	- Pink quartzite	50 - 55	
24'	- Purple siltstone	65 - 70	
5'	- Pink quartzite	60 - 80	
8'	- Purple siltstone	75 - 80	
1'	- Pink quartzite	55	
3'	- Purple siltstone	70	
3'	- Fine grained quartzite	55	
35'	- Interbedded purple siltstone and purple argillite	60 - 70 90 - 95	

OVERBURDEN

Grinnell Formation, Sage Creek, British Columbia

From top:		CPS
1'	- White quartzite	55
4'	- Green argillite	85
1'	- White quartzite	50
14'	- Green argillite	65 - 85
8'	- Green siltstone	45
1'	- Green argillite	70
3'	- Grey - green quartzite	45
3'	- Green argillite	95
6'	- Purple argillaceous sandstone	45 - 50
2'	- Red argillite	80
4'	- Buff argillite	70
3'	- Green argillite	85 - 90
8'	- Buff sandstone	50 - 60
3'	- Buff shale	80
2'	- Red sandstone	60
1½'	- Red argillite	100
3'	- Brown sandstone	60
1'	- Red argillite	95
7'	- Banded sandstone and argillite	50
3'	- Rose argillite	80
2'	- Sandstone	60
4½'	- Rose argillite	80 - 95
1'	- White quartzite	50
8'	- Rose argillite	80 - 90
6'	- Green argillite	80
1'	- White quartzite	50
15'	- Green argillite	80
4'	- Quartzite	50
5'	- Buff/green argillite	75
12'	- Green silty quartzite	50
4'	- Quartzite	50
12'	- Green argillite	95 - 100
1'	- Quartzite	60
1'	- Green argillite	95 - 100
1'	- Quartzite	60
4'	- Red grading to green argillite	80 - 90
1½'	- Grey/white quartzite	60
1½'	- Red argillite	85
2½'	- Green argillite	65
10'	- Red argillite	70 - 90
1½'	- Red argillite/White quartzite (2-4" layers)	60
4'	- Red argillite	80 - 85
2½'	- Green argillite	95
1'	- White quartzite	55
7'	- Buff/green argillite	65
4'	- Friable cross bedded green and white quartzite	55 - 60
12'	- Buff weathering green shale	75 - 80
5'	- Friable cross bedded green and white quartzite	45
8'	- Green argillite	80
7'	- White quartzite	50
6'	- Green argillite	90

Grinnell, continued

2'	- White and green quartzite	55
4'	- Red argillite	95
2'	- White quartzite	55
6"	- Buff sandstone	65
1½'	- Red argillite	100 - 105
4'	- Red/gree/white banded quartzite	55
6"	- Red argillite	80
4'	- Green quartzite	60
6'	- Red argillite	85
3'	- Red siltstone	50 - 70
5'	- Red argillite	90
1½'	- Quartzite	55
9'	- Red argillite	100 - 105
1'	- Quartzite	50
15'	- Red argillite	95
12'	- Buff weathering green siltstone	60
1'	- Red argillite	80
1'	- Buff weathering green siltstone	80
9'	- Green siltstone	70 - 80
4'	- Red/green argillite	80
4'	- Buff quartzite	50
4'	- Buff/green siltstone	60 - 70
18'	- Red and buff sandstone	50 - 70
2½'	- Red argillite	60
3'	- Quartzite	50
1'	- Red argillite	60
3'	- Interbedded red argillite and red quartzite	55
3'	- Buff weathering siltstone	80
8'	- Red argillite	80 - 85
6'	- Quartzite	50
5'	- Buff/green argillite	95 - 100
4'	- Buff/green siltstone	75--80
2½'	- Buff/green argillite with thin quartzites	70
7'	- Buff/green argillite	100 - 110
3'	- Quartzite	50 - 55
5'	- Buff/green argillite	110
10'	- Green argillite	50 - 60
4'	- Red argillite	90 - 95
10'	- Red argillite and white quartzite	60 - 70
1'	- Red argillite	110
5'	- Red argillite and white quartzite	75 - 80
1'	- Red argillite	105
2'	- Red argillite and white quartzite	95
1'	- Red argillite	120
3'	- Red argillite and white quartzite	55
2'	- Red argillite	110
38'	- Red argillite and white quartzite	110
1'	- Quartzite	65
12'	- Red argillite and white quartzite	85 - 105
3'	- Red argillite	95 - 110
1'	- Quartzite	50
5'	- Red argillite	105
4'	- Quartzite	60 - 85

Grinnell, continued:

1' - Red argillite	115
2' - Quartzite	70
6" - Red argillite	95
4' - Red quartzite	80
35' - Red argillite	100 - 115
3' - Red quartzite	60 - 70
22' - Red argillite	110
125' Section missing ----------------------------------	
55' - Red argillite	100 - 105
15' Section missing -----------------------------------	
44' - Red (mottled with green and buff) argillite	100
75' - Overburden	75 - 80
8' - Red argillite	100 - 110
20' - Overburden	60 - 65
6' - Green argillite	85
10' - Red argillite	105
1' - Red/buff siltstone	80 - 85
15' - Red argillite	105 - 110
3' - Red/buff siltstone	90
2' - Red argillite	120
1' - Banded white and green quartzite	95
3' - Green argillite	115 - 120
18' - Red argillite	95
6" - Buff siltstone	85
7' - Red argillite	110
2' - Banded green argillite	120 - 150
12' - Red argillite	75
2' - Green Argillite	75
33' - Red argillite	70 - 80
1' - Red siltstone	85
24' - Red argillite	90 - 95
1' - Red siltstone	75
8' - Red argillite	90
2' - Red siltstone	75
8' - Red argillite	95
3' - Siltstone	80
15' - Red argillite	75
3' - Siltstone	75
12' - Red argillite	75 - 80
3' - Buff weathering green siltstone	60
3' - Red argillite	70
18' - Red argillite	90
1' - Quartzite	60
12' - Red argillite	95
5' - Siltstone	65
