GEOLOGICAL RECONNAISSANCE

STAMPEDE OILS LTD.

REVELSTOKE AREA

1968

GEOLOGICAL RECONNAISSANCE

OF THE AREA BETWEEN THE TRANS CANADA HIGHWAY

AND THE SOUTHERN PART OF EAGLE PASS RIDGE

(Situated in southeast quarter of Seymour Arm one degree quadrilateral of which the southeast corner is 51 degrees north and 118 degrees west)

Prepared for

M.C.R. EXPLORATIONS LTD.

VANCOUVER

on behalf of

STAMPEDE OILS LTD.

1070 ELVEDEN HOUSE

CALGARY 2

by

George A. Wilson, P. Geol. Eng.

GEORGE A. WILSON GEOLOGICAL CONSULTANTS LTD.

CALGARY

Field work and report completed during the periods August 6-September 7 and September 10-December 8, 1968, for M.C.R. Explorations Ltd. on behalf of Stampede Oils Ltd.

George A. Wilson

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ILLUSTRATIONS

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LOCATION

The area covered by this report extends from the Trans-Canada Highway north to the southern and western part of Eagle Pass Ridge. It is bounded on the East by the Jordan River and on the West by an irregular line extending in a northwesterly direction from the Trans Canada Highway to Eagle Pass Ridge just west of the boundary between Kamloops and Revelstoke Districts.

ACCESS

A good gravel road leads from the Trans Canada Highway, a short distance west of the Columbia River, to the confluence of the Hiren Creek and the Jordan River. From there a mine road negotiable by four-wheel drive vehicles extends west up Hiren Creek. Logging roads, most of which are nearly impassable, extend into the lower slopes on both sides of the Jordan River. The best of them is on the north side of Kirkup Creek. It is some two miles long. Another logging road leads up Crazy Creek valley from the West but does not reach the area. None of the logging roads go beyond timber and so are of little use in mineral exploration.

The only practical method of access to outcrops is by helicopter. Landing sites are abundant above 6,000 feet, scarce from 6,000 to 4,500 feet and absent below that level except at old mill-sites. One suitable landing at a lower elevation is near the sharp bend on Kirkup Creek at an old logging operation. Another is on a large rock reported to be near the head of Crazy Creek.

TOPOGRAPHY

The area is exceptionally rugged. The Jordan River is at an elevation of 2,000 feet. Ridge summits are above 7,000 feet. Most of the valleys are at elevations of 2,000 feet to 4,000 feet. Many of the ridges are bounded by cliffs and cannot be climbed.

Vegetation below 4,500 feet consists of a spruce and cedar with a dense undergrowth of devil's clubs. Outcrops there are sparse. Above 4,500 feet density of timber decreases and rock exposures are progressively better. Above 6,000 feet rock exposures are good to excellent.

It has been necessary to assign names to geographical features to facilitate description. The ridge immediately north of the highway is referred to here as Tonkawatla Ridge for the stream which flows in the valley south of it. Similarly the ridge north of

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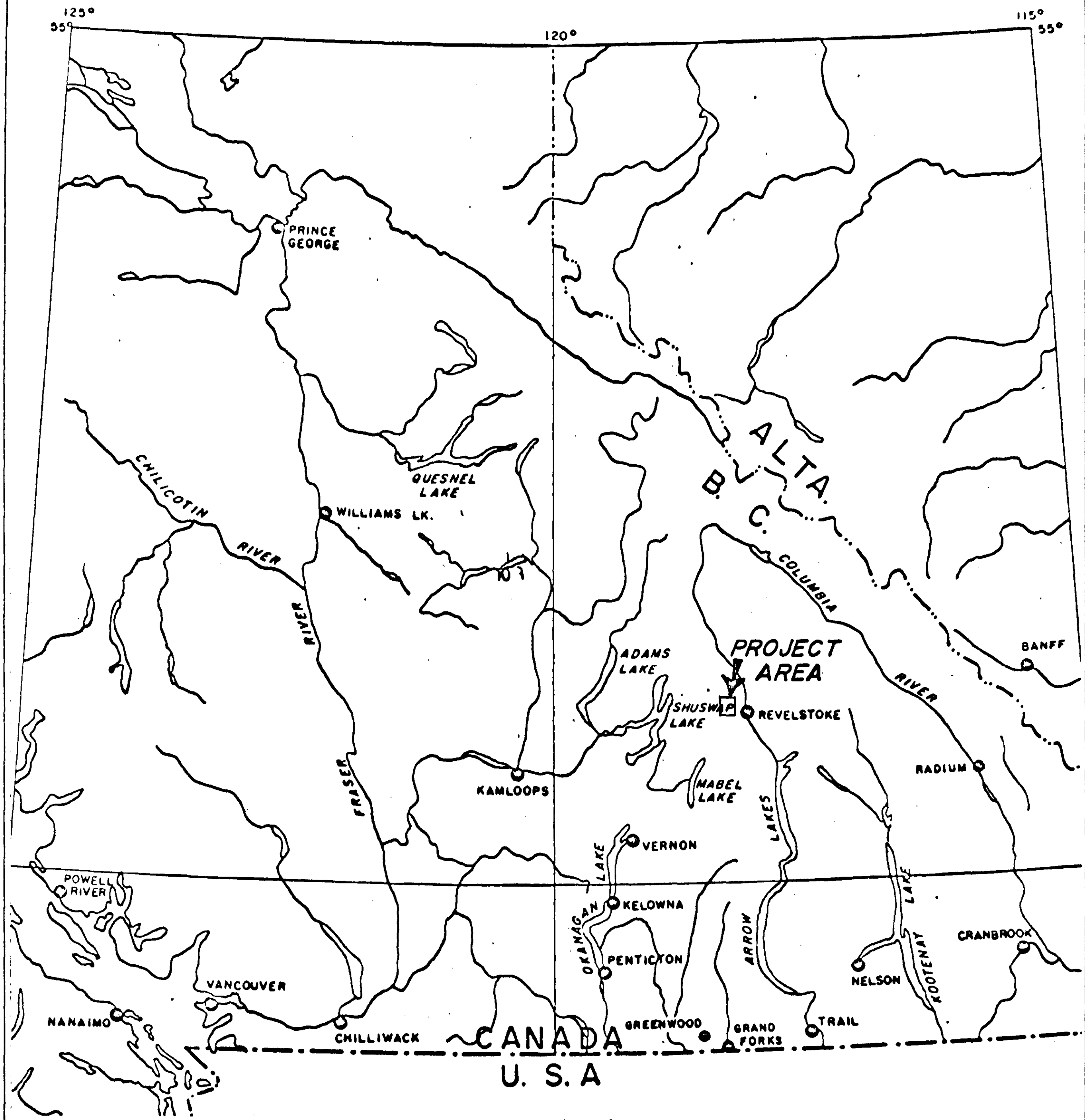

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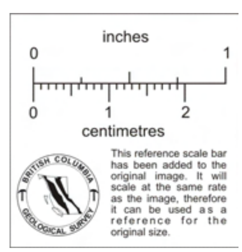
FIGURE I

LOCATION MAP



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Kirkup Creek is called Kirkup Ridge. The stream north of Kirkup Ridge is a tributary of Hiren Creek and is called South Hiren Creek.

OBJECT OF INVESTIGATION

An area the size of this one in such rugged terrain can't be thoroughly mapped in one season. There is a choice of collecting great detail in a confined area each year or of obtaining a general idea of the geology of the entire area and then completing the detailed geology where necessary in subsequent years. The second method was deemed most suited to the integrated exploration program being conducted on the mineral claims.

PREVIOUS WORK

The terrain adjoining the north side of the area covered by this report was mapped by Dr. J. T. Fyles of the British Columbia Department of Mines. This area is also part of a much larger region mapped by J. O. Wheeler of the Geological Survey of Canada and described in Paper 64-32 of that agency.

OPERATIONS

On August 9, a crew comprising a geologist, two assistant geologists and two partners working under the direction of W. Meyer, the geologist in charge, commenced work from base camp near the mouth of Hiren Creek. Operating procedure was to move pairs of men to work at selected places, by helicopter, each day, and to return them to camp each evening. Inclement weather in August seriously affected the volume of work done.

From September 1 to September 7 the crew consisted of a geologist, two assistant geologists and two helpers working under the direction of George A. Wilson.

GEOLOGY

Lithology

It is impossible in one season to provide a complete description of the lithology in an area with the complex structure and metamorphic history that this region has. This classification must be considered tentative.

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The naming of rock units and the classification of the units into a succession is something of a problem. Part of the difficulty is to make enough sub-divisions to define lithology and structure without producing an unintelligible map, and part of the difficulty is the absence of clear distinctions between many of the units. Each major unit includes elements of each of the others. All are foliated and some are schistose. Mineral content varies little as to type but varies considerably as to proportion. There are all gradations between quartzite with minor feldspar, and granite with 30% granular quartz. One common, though not universal, character of the quartzose rocks, including some of the granite gneisses, is the existence of rounded and, in some cases, frosted quartz grains.

Among the quartz free or quartz poor rocks there is a series grading from schistose biotite rich rocks to poorly foliated or indistinctly laminated mica poor generally granular rocks. The colour of biotite seems to vary consistently. In units 2, 3 and 4 it is mauve to brown. In units 5, 6, 7, 9 and 10 it is brown to dark greenish brown or dark brownish green.

Identification of nephelite under the binocular microscope was only slightly less difficult than in the field. Fractures which commonly occur in quartz rendered hardness determinations difficult and in some places produced surfaces nearly as smooth as the cleavage of nephelite. Many of the specimens lack a good weathered surface and so it was impossible to be certain whether a rock was a nephelite syenite or a granite. This accounts for the lack of agreement on Figure 3 (Map 3).

Gradations from one rock type to another related type along trend are less obvious than those which occur transverse to trend but probably occur. This may be due to lithologic variations in the original sedimentary section to changes in metamorphic grade, to intrusion of crystalline rocks prior to Phase II folding, or due to an incomplete understanding of structure.

Rock types recognized in two creeks which flow north of Tonkawatla Ridge, Figure 4 (Map 5) center, are dissimilar. Photogeology shows that although rock exposures between the two creeks are poor major units are continuous from one creek to the other except for one small displacement by a minor fault. It is reasonable to infer that metamorphism in the vicinity of the eastern of the two streams was more intense than in the western stream.

Metamorphic grade appears to be higher on Kirkup and Eagle Pass Ridges, and this may account for the difficulty of assigning specimens to one or other of the map units with any degree of certainty and consistency (See Section on Correlations, page 5). In such regions, interpretation of air photographs is of considerable help in establishing lithologic trends and in interpreting structures.

Quartzite members a few feet to several tens of feet thick occur in unit 2 and comprise a significant part of units 3 and 4. The quartzites were mapped as separate units in the field where possible. For the sake of simplicity in this report, the quartzite members have been included with the units of which they seem to be a part and their positions denoted with the letter "Q".

No map unit 1 is used. Future work may reveal the desirability of dividing units 2, 5 or 7 and applying the symbol 1 to one of them.

Map unit 2 is a succession of mixed quartz-feldspar-biotite and biotite-feldspar gneisses with layers of syenite and granite. As with many of the other units, quartz lenticles are common and nearly all are crushed.

Map unit 3 consists of grey and brown weathering gneisses with minor interbedded quartzite. Biotite-sillimanite schist forms a conspicuous proportion of the unit. The granular quartzose nature of some members in the series may be evidence that this unit is derived from arkoses and impure sandstones. Small outcrops of marble were found in strata placed in this unit.

Map unit 4 includes one or more quartzites, varying in thickness from twenty to more than one hundred feet, separated by marble and various quartz mica schists. The mica schists are at least partly biotite-sillimanite schists. The calc silicate rocks composed of feldspar, actinolite-tremolite, and diopside, with traces of calcite and garnet occur in this unit. The unit also includes a discontinuous gneiss with a significant proportion of dark green hornblende, particularly on the south slope of Tonkawatla Ridge.

Map unit 5 is a gneiss, generally granular, in which quartz, feldspar and mica are the dominant constituents, but which also contains minor amounts of calcite and hornblende. The most noteworthy characteristic of this unit is its tendency to weather green or grey green.

Map unit 6 is a brown weathering biotite-sillimanite gneiss. On fresh surface, it is grey to brown grey. The sillimanite porphyroblasts contain a high proportion of biotite and feldspar. The relationship of map unit 6 to map units 2 and 3 which also contain similar biotite-sillimanite schists is unknown.

Map unit 7 is a grey weathering biotite-feldspar hornblende or biotite quartz feldspar to quartz feldspar biotite gneiss. Variations in lithology are abrupt and narrow across strike and seem to continue for some distance along strike. Texture is generally granular and the quartz commonly is rounded and in some specimens frosted. Map unit 7 may contain lithologies properly placed in map unit 9.

Map unit 8 is pegmatite which intrudes units 4, 5 and 7 on Tonkawatla Ridge and unit 6 on Kirkup Ridge.

The pegmatites on Tonkawatla Ridge are most abundant in the vicinity of a small lake near the west edge of Figure 5 (Map 6) where they have two prominent directions east of north and north of east. These directions probably represent tension fractures. The pegmatite dykes and sills also occur on the eastern part of Figure 4 (Map 5) but are less numerous. All of the dykes examined are fairly coarse intergrowths of quartz feldspar and black tourmaline to several inches long. Lithium mica and tourmaline are significant components of several and rhodocrosite is abundant in one.

One such dyke occurs in gneisses some 6,000 feet west of the east margin of Figure 4 (Map 5) on Tonkawatla Ridge. The dyke is some 180 feet long, a maximum of thirty feet thick and lenticular in shape. It is sill-like at one end and dyke-like at the other. At least one large block of host rock is included in the dyke. Tourmaline, lepidolite and rhodocrosite are important components in the thicker, coarser part of the dyke although they occur throughout. Most of the rhodocrosite is in a smaller later dyke which crosses the sill in a nearly north direction almost transverse to the main dyke.

The host rock is a dark grey to green grey mica schist trending 280° and dipping south at 40°.

The pegmatite dykes and sills on Kirkup Ridge are fairly small and are more a porphyritic granite than a pegmatite. They are composed of quartz and feldspar with minor amounts of biotite. Tourmaline is lacking. The form of the dykes is similar to that of the dykes on Tonkawatla Ridge. They occur in parallel matching pairs which taper in opposite directions so that aggregate dyke width remains nearly constant. They trend at 050° and dip nearly vertically.

Map unit 9 is a gneissic syenite and syenite gneiss very similar to unit 2 but with much more of the syenite component. The difficulty of distinguishing between nephelite and quartz and its effect on rock classification has been discussed on page 3.

Map unit 10 comprises all quartz-feldspar-biotite rocks in which feldspar and biotite are the dominant constituents, and in which there appear to be two feldspars. The range in composition, particularly with respect to quartz, together with the manner in which these variations occur, are reminiscent of an intensely metamorphosed system of paragneisses.

Correlations with Previous Work

This discussion of lithology would be incomplete without an attempt to correlate the units used herein with those used by

J. T. Fyles in the area he mapped to the north. This is complicated partly by the general difficulty of naming rock units and partly by an apparent change from syenitic to granitic gneisses near the north margin of the area covered by this report.

Units 3 and 6 as applied to rocks north of Kirkup Creek probably correlate with unit 1 of J. T. Fyles. Units 4 and 5 of this report may be equivalent to unit 5 of Fyles. This latter correlation is a questionable one because units 4 and 5 of this report were not recognized on Kirkup Ridge. In fact there is very little similarity between the rocks of Tonkawatla Ridge and those of Kirkup Ridge. This could be due to higher metamorphic grade on Kirkup Ridge of the same rock units or it could be due to a considerable difference in age and type of strata between the two areas. The second possibility is considered the more likely. Rock units on Derekson Ridge and Mt. Copeland can be traced south with a fair degree of certainty through some eight miles of complex structures to Eagle Pass Ridge and the east end of Kirkup Ridge, but cannot be correlated across Kirkup Creek to Tonkawatla Ridge. Further, the strata on Tonkawatla Ridge seem to be different from strata on Mt. Copeland and Derekson Ridge. It is unlikely that this is entirely due to facies changes in the original strata although such changes are a possibility.

This part of the problem may be solved by additional study of the succession of quartzites which crop out on the west end of Kirkup Ridge between the north and south forks of Crazy Creek. If, as seems probable, the quartzites don't correlate with the quartzites mapped by Fyles on Eagle Pass Ridge, then the succession on Kirkup Ridge is nearly 4,000 feet below the section on Tonkawatla Ridge (Figure 6). If the quartzites on the west end of Kirkup Ridge do correlate with those on Eagle Pass Ridge, then additional structure data are needed in the headwaters of South Hiren Creek and the existence of the postulated syncline on the north slope of Tonkawatla Ridge requires verification.

The calcareous lime silicate gneiss (Map unit 3 of J. T. Fyles) which Fyles shows to crop out in the valley of South Hiren Creek along the south limb of a Phase II antiform should reappear in the valley of Crazy Creek just outside the map area, if the Kirkup Ridge section correlates with Eagle Pass Ridge.

Structure

Little can be said about structure at this stage of mapping in so complex an area. Attitudes of drag folds indicate that the two phases of folding, known in adjacent areas, also occur here (Fyles, J.T.; Ross, J.V., etc.). Attitude of hinge lines are shown on Figures 3, 4 and 5 (Maps 4, 5 and 6). The Phase I folds trend southwest: the Phase II folds trend northwest. Insufficient data are at hand to delineate the form of either set of folds although both, especially the Phase II folds, are partly delineated.

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On Figure 5 (Map 6) along the lower reaches of Kirkup Creek the shape and attitude of drag folds and the thickness of outcrop on a small tributary stream are compatible with the existence of the nose of a Phase I fold open to the east. The position of the fold is shown on Figure 5 (Map 6).

The shape of the outcrop of nepheline syenite (9N) in the northwestern part of Figure 3 (Map 3) may be attributable to a Phase I fold which is not completely traced out.

Phase II folds are more obvious than Phase I folds. A Phase II antiform with an axial plane dipping to the southwest and with variable plunge extends along the upper slopes of the north side of Tonkawatla Ridge (Figures 4, 5, Maps 5, 6).

Photogeology and outcrop data seem to indicate that a Phase II synform trends eastward along the east end of Tonkawatla Ridge, Figure 5 (Map 6). The effect that this synform has on outcrop traces farther west on the north slopes of Tonkawatla Ridge is not fully understood.

The attitudes of hinge lines of Phase I parasitic folds in a creek on the south side of Tonkawatla Ridge near the east side of Figure 4 (Map 5) are compatible with a Phase II antiform with a southeasterly trend. They can also be explained by local deformation along a fault which occupies the upper parts of the stream valley.

Both Phase I and Phase II folds may exist on Kirkup Ridge but they can't be mapped at this stage.

Faults, both thrust and strike-slip or normal, are numerous. The thrust faults generally trend in a northwest-southeast direction, dip either north or south and are generally displaced by the strike faults. Examples of thrust faults occur on Tonkawatla Ridge near the margin of Figures 4 and 5 (Maps 5 and 6), on Eagle Pass Ridge Figure 3 (Map 3), and in the valley of South Hiren Creek Figure 3 (Map 3).

The strike slip and normal faults generally trend 10^{o} to 20^{o} west of north. The direction of movement wherever discernible is west side south relative to the east side. These faults, being the locus of watercourses, are clearly recognizable on aerial photographs and topographic maps. Displacement could not be established on all parts of some of them.

Another and probably older set of normal faults is less obvious. The members of this set generally include andesite or pegmatite dykes. This is exemplified on Tonkawatla Ridge near the west side of Figure 5 (Map 6) where an andesite dyke occupies a fault with a north-northeast trend. In the same area pegmatite dykes tend to occur in old east-west faults with small vertical displacements.

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ECONOMIC GEOLOGY

The mapping program did not reveal the existence of any economic mineral deposits although a talc schist and lithium bearing pegmatites, one of fairly large size, were found.

The talc schist, for which an assay is included as appendix 1, is too siliceous to be attractive.

The pegmatites of Tonkawatla Ridge were described on page 5. The dykes are small and there seems to be a very poor demand for lithia at the present time. None-the-less it is worthwhile spending two days examining the pegmatites on the east end of Tonkawatla Ridge.

The geochemical survey established the existence of several geochemical anomalies.[1]

The anomalies will be discussed in the order used in the Bondar-Clegg report. Priorities and numbers are those of Bondar-Clegg.

Anomaly: No. 1.

Priority: Second.

Anomalous Metal: Zinc strong; copper and molybdenum weak.

Locality: Victor Creek a stream which flows in a southeast direction from the crest of Tonkawatla Ridge to Victor Lake (Map 5).

Geology: Victor Creek occupies a two and one-half mile segment of a fault which extends from a place near the headwaters of Copeland Creek some 37 miles south southwest to the west side of Cranberry Mountain (Jones, A. G.).[2] The crest of Tonkawatla Ridge is underlain by Map units 3 and 4, apparently folded around the axis of a Phase II anticline. Below Map unit 3 Victor Creek drains an area underlain by gneisses of Map unit 2.

The zinc probably occurs in veins or replacements in and adjacent to the fault. The strength and priority assigned the anomaly together with its occurrence in a fault zone detract from it. On the

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[1]Forgeron, F. D., <u>in</u> Regional Geochemical Survey Kirkup Creek-Hiren Creek and Revelstoke Mining Division for Stampede Oils Ltd. by Bondar-Clegg & Company Ltd., Ottawa.

[2]Jones, A. G. Vernon Map-Area British Columbia; Geol. Surv. Canada, Mem 296, 1959.

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other hand, mineralization may expand laterally into favourable hosts such as the marble of unit 4 or the calc-silicates of unit 5.

The occurrence of calc-silicates in Crazy Creek postulated on page 6 should be favourable for expanded mineralization. The geochemical survey, however, did not find an anomaly in Crazy Creek and so it must be assumed the unit is absent or mineralization did not expand into it.

The weak copper-molybdenum anomaly is less likely to be related to the fault zone. It may be due to copper molybdenum mineralization in the gneisses of units 3 and 4 on the sloping ridges adjacent to Victor Creek and transverse to Tonkawatla Ridge. Pyrite-pyrrhotite mineralization to which the copper-molybdenum anomaly may be related occurs along a fault northwest of Victor Creek and which may be a branch of the Victor Creek Fault. The fault is occupied by a tributary of Crazy Creek which has no anomalies.

Recommendations: In addition to the recommendations of Bondar-Clegg & Company Ltd., we recommend reconnaissance on the ridges adjacent to Victor Creek to determine the mode of occurrence of copper-molybdenum. Follow-up work in the tributary to Crazy Creek at the west end of Map 5 on Tonkawatla Ridge is also recommended.

Anomaly: No. 2.

Priority: First.

Anomalous Metal: Copper.

Locality: North slopes of the west end of Kirkup Ridge draining into the north fork Crazy Creek.

Geology: The top of the ridge and the south slopes are underlain by schists and gneisses of Map unit 10. Trend is north-northwest. The geology of the north slopes is not well known. Photogeology indicates that much of the north slope is underlain by gneisses with a westerly trend and steep north dip. The north and south slopes are separated by a fault which extends east beyond the headwaters of Crazy and South Hiren Creeks and which is displaced by the north trending faults. The shape of a drag north of the fault indicates that there is a strong east component of movement.

Recommendations: See Bondar-Clegg & Company Ltd.

Anomaly: No. 3.

Priority: Third.

Anomalous Metal: Weak copper-molybdenum.

Location: The south slope of Eagle Pass Ridge above the headwaters of South Hiren Creek.

Geology: Map unit 3 with layers of 9 and 10 trends in a southwesterly direction and dips steeply south along the south side of Eagle Pass Ridge. The north slope of the ridge is underlain by quartzites (Fyles Map unit 2) and calc-silicate gneisses (Fyles Map unit 3). These beds trend across the crest of the ridge in the vicinity of the anomaly. A fault which is probably a thrust separates the quartzite and calc-silicates (2 and 3 of Fyles) from the grey and brown weathering gneisses (Map unit 2) of this report (Figures 3, 6). The anomaly is centered near the point where the fault trace and the stream which occupies it cross the valley floor.

Recommendations: See Bondar-Clegg & Company Limited.

The anomaly seems to be of too low intensity to merit consideration at this time.

Anomaly: No. 4.

Priority: Second.

Anomalous Metal: Zinc strong, and copper-molybdenum weak to questionable.

Location: Southeast corner Map 3 along a stream tributary to South Hiren Creek from the crest of Kirkup Ridge.

Geology: On the west side of the stream Map unit 7 crops out on the crest of the ridge and below it is map unit 3. East of the fault are Map units 10 and 3. Structure in the area is not fully understood. Dip is steep to northerly. A Phase II antiformal axis should be just south of the crest of the ridge. A Phase I fold may be represented by beds resembling Map unit 7 on the east side of the creek and which seem to be folded about a vertical hinge line open to the west. The stream occupies a part of a later north-south fracture zone. The mineralization is probably in or immediately adjacent to the fault. Approximately one mile east traces of galena were found in float in what is probably another similar fault zone.

Recommendations: It is recommended that more detailed mapping be done in the vicinity of the fault together with the recommendations of Bondar-Clegg & Company.

Anomaly: No. 5.

Priority: Third.

Anomalous Metals: Zinc, molybdenum and copper all weak.

Location: East end of Tonkawatla Ridge in a stream draining a small lake (Map 6).

Geology: The stream drains an area underlain by Map units 4 and 5 folded about a Phase II antiform much faulted and with numerous pegmatite dykes.

Recommendations: In spite of the weakness of the anomalies it is recommended that the pegmatite dykes be examined for significant deposits of lithium bearing minerals.

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BRITISH COLUMBIA
ENGINEER
Expires Aug. 4/69

George A. Wilson

George A. Wilson, P. Geol., Eng.

GEORGE A. WILSON GEOLOGICAL CONSULTANTS LTD.
212, 634 - Sixth Avenue S.W.,
Calgary, Alberta.

PHONE 469-2391

APPENDIX (i)

CREST LABORATORIES LTD.

B.C. REGISTERED ASSAYERS
INDUSTRIAL and RESEARCH CHEMISTS

7911 ARGYLL ROAD
EDMONTON, ALBERTA

October 31, 1968.

Company ______
Property Mt. Copeland
______
Nov. 7/68
TMN

Stampede Oils Ltd.,
700 Elveden House,
Calgary, Alberta.

Reference: Samples - Lab No. 696: 696-1 - Stampede Talc #1 and
696-2 - Stampede Talc #2.

Dear Sirs:

The above samples submitted for talc appraisal were sent out for X-ray diffraction analysis, the results of which are tabulated below:

696-1 Showed that the principal constituents are quartz, feldspar, sillimanite and mica.

696-2 Showed that the principal constituents are chlorite, mica, talc, and quartz.
"Mica and talc are fine-grained and are intimately intergrown with chlorite."

It would appear that a benefication program to obtain a saleable talc product from the material represented by specimen, 696-2, would be difficult, costly and in the face of competition from other sources of talc, an unlikely venture.

Yours very truly,

CREST LABORATORIES LTD.

F. C. Burgess

Frederick C. Burgess,
Chief Assayer.

FRB/bb

Appendix (ii)

The writer of this report, George A. Wilson, is a graduate of Queen's University, Kingston, 1949, B.Sc. Geology and Mineralogy; and of the University of British Columbia, 1951, M.A.Sc. Geology, and has had a number of years of relevant experience.

The writer is a registered Professional Geologist and Professional Engineer in the Association of Professional Engineers of Alberta and is a non-resident licensed Professional Engineer registered with the Association of Professional Engineers of British Columbia.

George A. Wilson