

81-#1051-9817

GEOLOGICAL

ASSESSMENT REPORT

on the

BROOKLYN CROWN-GRANTED CLAIM

PHOENIX GROUP

PHOENIX AREA

GREENWOOD MINING DIVISION

NTS: 82E/2E
Latitude: 49° 06.2' North
Longitude: 118° 36.1' West
Owner: Noranda Exploration Co. Ltd.
Operator: Kettle River Resources Ltd.
Consultant: K.L. Daughtry & Associates Ltd.
Author: W.R. Gilmour
Date: November 17, 1981

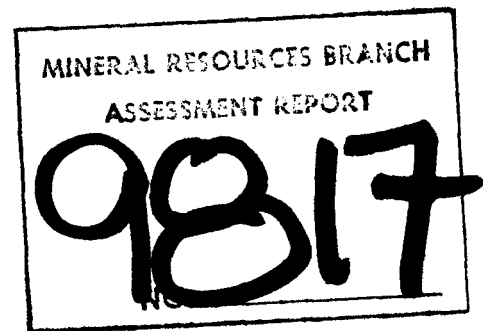


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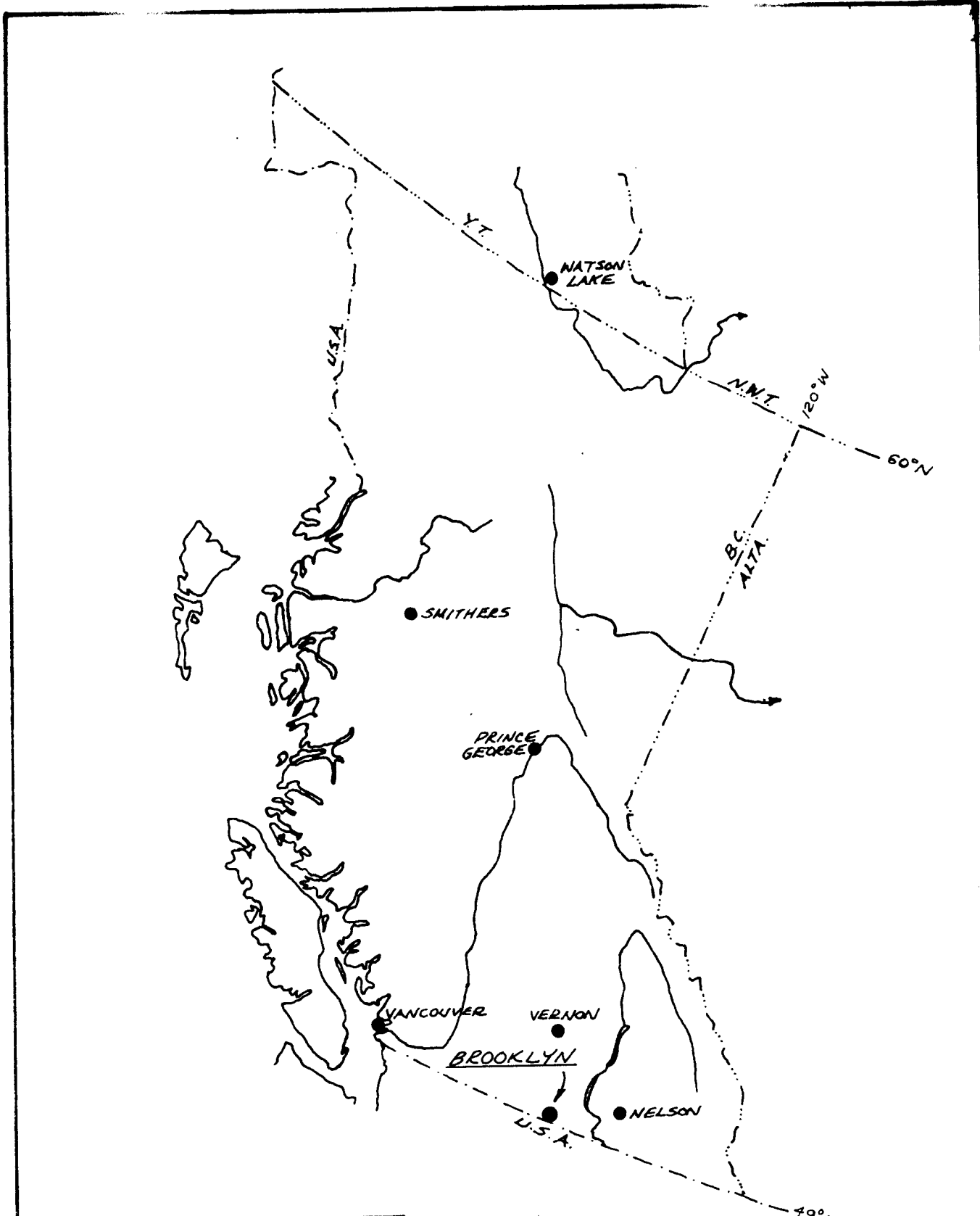
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SUMMARY

This report describes the results of a geological mapping and sampling programme carried out on the north portion of the BROOKLYN Crown-granted claim during September and October of 1981. Mapping was carried out at a scale of 1:500 and a 20 m X 20 m grid, totalling 1260 m, was installed for ground control. A total of 24 rock samples were collected and assayed or geochemically analysed for gold, silver and/or copper. Two soil samples were collected and analysed for copper, gold and silver.

Significant stratiform and stratabound copper-gold mineralization occurs on the BROOKLYN. The property exhibits good exploration potential and a programme of further exploration is recommended.



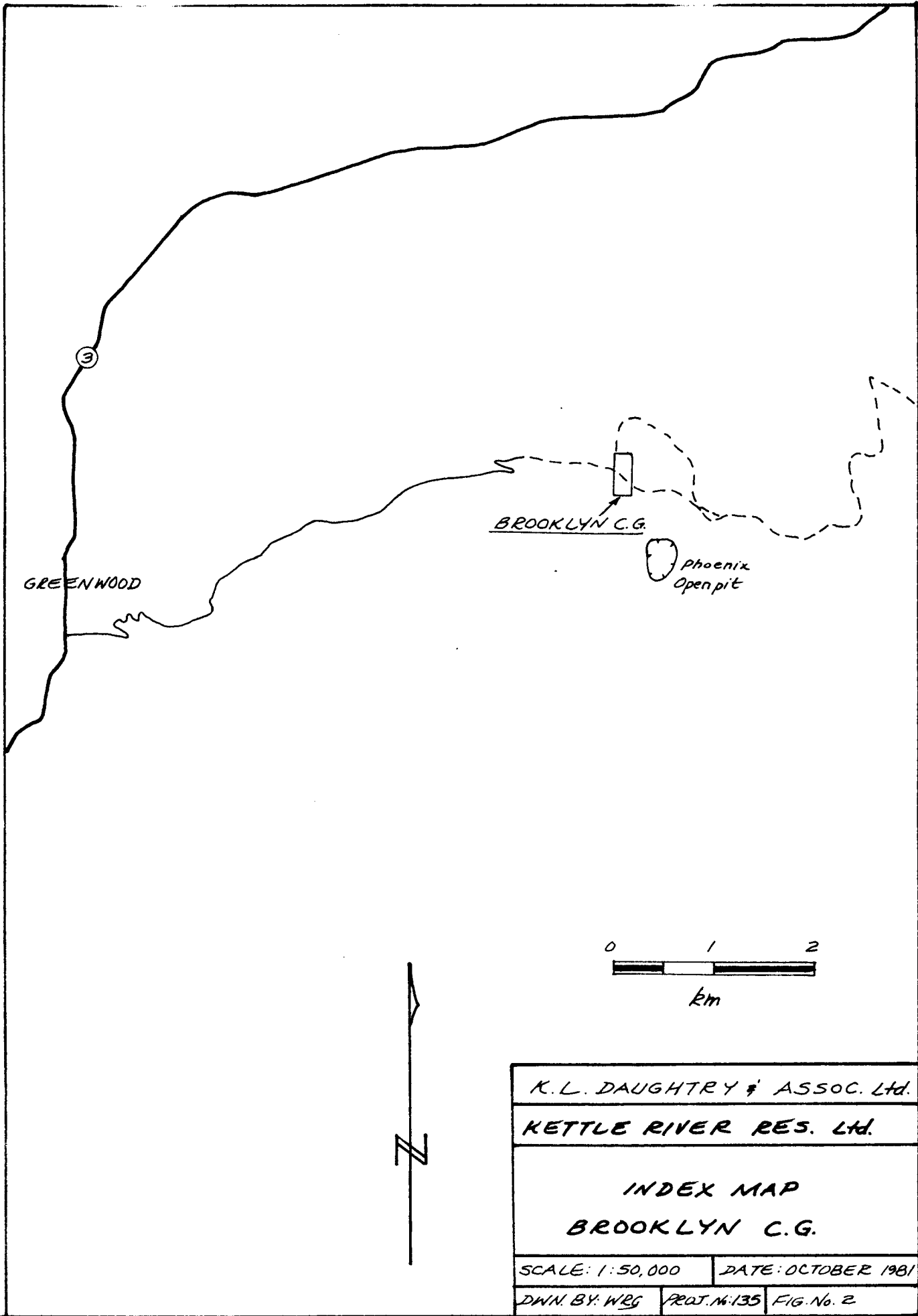
K.L. DAUGHTRY & ASSOC. LTD	
KETTLE RIVER RES. LTD.	
LOCATION MAP	
BROOKLYN C.G.	
OCTOBER/81	FIG. NO. 1

LOCATION, ACCESS, AND TOPOGRAPHY

The BROOKLYN claim is located 5.5 km east of Greenwood, in the Phoenix Camp of the Boundary District of south-central British Columbia. The BROOKLYN is at 49°06.2' N. Latitude and 118°36.1' W. Longitude. The National Topographic System map reference is 82E/2E.

Good access is provided by well maintained gravel roads, adjacent to the area mapped. The distance westerly, via a gravel and then paved road, to Greenwood is about 8 km and easterly is about 12 km to Highway 3.

The elevation of the north glory hole is about 1400 m and the topography has a moderate slope to the southwest. The southern half of the claim is covered by waste rock and mine tailings from the Phoenix mine. Much of the north glory hole has also been filled with tailings.



K.L. DAUGHTRY & ASSOC. LTD.	
KETTLE RIVER RES. LTD.	
INDEX MAP BROOKLYN C.G.	
SCALE: 1:50,000	DATE: OCTOBER 1981
DWN. BY: WRG	PROJ. N: 135
FIG. No. 2	

PROPERTY

The BROOKLYN Crown-granted claim (Lot 796) was located in 1891 by Joseph Taylor and Stephen Margott. The claim is 20.65 acres (8.36 hectares) in area and is owned by Noranda Exploration Company Ltd. The IDAHO (Lot 981) and the NEW YORK (Lot 901) Crown-granted claims adjoin to the south and north respectively. The BROOKLYN is presently grouped in the PHOENIX group.

Kettle River Resources Ltd. acquired the property on option from Noranda Exploration Company Ltd. in 1981.

HISTORY

The first recorded production from the BROOKLYN was in 1892 when 120 tons were shipped. The Dominion Copper Company operated the BROOKLYN mine, although not continuously, from 1901-1908. To the end of 1908 the mine was credited with producing 250,293 tons of ore grading 1.2% copper, 0.068 oz./ton gold, and 0.35 oz./ton silver (59). However, LeRoy (45) estimated that only about 135,000 tons came from the BROOKLYN during this period. This discrepancy could account for significant differences in tenor from the above mentioned grades. Minor production occurred in 1918, 1919, 1926, 1928 and 1932.

The IDAHO mine, the continuation southward of the BROOKLYN zone, was worked between 1906 and 1916, producing 2,570 tons of ore grading 0.9% copper, 0.033 oz./ton gold, and 0.21 oz./ton silver.

Gold values much above the average for the Phoenix camp have been described in various reports:

"Beyond the orebody proper in the north end of the Brooklyn, pyritic crystalline limestone occurs in a raise from the 150 foot level. A sample was taken across the face and an assay made by H. A. Leverin of the Mines Branch, which gave 0.3 ounce of gold and 0.4 ounce of silver to the ton." (LeRoy, p 101)

"The rocks in which the copper ores were mined in the past were limestone, whereas the recently found gold values are associated with pyrite and calcite in brecciated volcanics lying on the hanging-wall side of the tilted sedimentary beds...a 5-foot chip sample taken across the face of the 80-foot level in the BROOKLYN assayed: Gold, 0.80 oz.; silver, 0.2 oz. per ton; copper, nil. It has been a well known fact for some years that a gold-pyrite zone existed between the STEMWINDER and BROOKLYN mines, and also that some high gold values were associated with the copper ores, but no work has been done as yet to prove the continuity or width of it." (1932 B.C.M.M. Annual Report, p 129)

"Immediately east of the north end of the Brooklyn [south] glory hole, a promising area was pointed out by W.E. McArthur, a former operator. The following samples were therefrom obtained: Three feet assaying 0.44 oz. gold and 0.5% copper per ton; six feet assaying 0.35 oz. gold and 0.4% copper; and eight feet assaying 0.16 oz./ton gold and 0.3% copper... This [showing] will be tested by Hole B8 now being drilled." (Northern Miner, Jan. 23, 1947)

No gold values were reported from Hole 8 drilled on the BROOKLYN claim (54).

Diamond drill hole B-16 gave the following results (50).

<u>Footage</u> feet	<u>Length</u> feet	<u>Au</u> oz./ton	<u>Cu</u> %
104-111	3	.02	2.5
129-131	2	.02	1.7
146-150	4	.04	1.6
153-156	3	.06	5.7
225-226	1	.10	9.7
306-312	6	.10	0.5
313-314	1	.09	1.7
318.5-321	2.5	.25	tr
321-324	3	.21	1.2
324-327	3	.38	tr

The 8.5 foot section (318.5-327') averaged 0.30 oz./ton gold, with generally low copper values. This zone was intersected beneath the road south of the glory hole (54).

Kilburn (44) shows a "hanging wall gold section" (east) and a "foot wall copper section" (west) on the 80 foot level of the mine.

From 1936-1940 the mine was operated by lessees, W.E. McArthur being the lessee from 1937-1940. Production during this period amounted to 34,250 tons of ore grading 0.86% copper, 0.20 oz./ton gold, and 0.24 oz./ton silver (59). Note the higher gold grade and the lower copper and associated(?) silver grades.

In 1947, drilling by the Brooklyn-Stemwinder Gold Mines Ltd. on the BROOKLYN (49,50,54) encountered gold mineralization south of the north BROOKLYN pit (the southern and larger pit is presently covered by mine waste and tailings).

In 1948, diamond drilling was done on the NEW YORK to test a pyrite-gold showing. However, "although considerable pyrite core was obtained, the assays were not encouraging" (36).

During 1960-1961 and 1963-1964, Phoenix Copper Co. Ltd. a wholly owned subsidiary of Granby Mining Corporation mined at least 140,361 tons of ore from an open pit on the IDAHO claim. To the end of 1964 the BROOKLYN-IDAHO deposits produced at least 275,000 tons of ore.

In 1966 and 1968 Granby drilled percussion holes in the BROOKLYN-IDAHO area

looking for open-pit potential but the cuttings were only assayed for copper (43,51,52,53,54). The results were deemed "not encouraging" (53), although some ore grade intersections were drilled. In 1970 Granby obtained gold values from some of the grab samples taken from the old trenches near the BROOKLYN mine (54).

Noranda Exploration Company Ltd. acquired the property from Granby in 1978. Kettle River Resources Ltd. acquired an option on the property in 1981.

WORK PROGRAMME 1981

Backhoe trenching, with a John Deere 450 C, cleaned up old slumped trenches and dug some new ones. The total length of trenching done was 170 m and ranged from 2 m to 4 m wide and 0.5 m to 4 m deep. A 20 m x 20 m grid, totalling 1260 m, was installed for ground control. The trenches and the old glory hole were mapped and sampled at the scale of 1:500.

REGIONAL GEOLOGY AND MINERALIZATION

Proterozoic(?) gneisses and schists are the oldest rocks in the Greenwood area. Their relationship to the younger rocks is unclear at present.

Pennsylvanian-Permian rocks comprise two distinct rock units (55); 'oceanic' basalt and chert, and 'trench and arc' clastic (chiefly pelitic) and volcanic (andesite to rhyolite) rocks. The Upper Paleozoic rocks have undergone moderate metamorphism and folding.

Tectonically emplaced rocks of probable Permian age (55) commonly occur in the area. Minor platinum (SAPPHO), chromium and nickel showings are related or occur in these generally serpentinized rocks. Deposits spatially associated with the Ironclad serpentinite (WINNIPEG, ATHELSTAN-JACKPOT, GOLDEN CROWN, KENO, IRONCLAD, and WINNER) produced 16,800 oz. gold and 47,000 oz. silver from 74,000 tons of ore.

Overlying the Upper Paleozoic rocks are middle to upper Triassic rocks of the Rawhide and Brooklyn formations. Shales of the Rawhide Formation are conformable with the overlying Brooklyn Formation (57). The Brooklyn Formation comprises three main rock types: (55)

1. Clastic units of shale, greywacke and/or conglomerate. The clasts in the conglomerates are either chert pebbles ('sharpstone'), volcanic rocks, or limestone ('puddingstone').
2. Carbonate units, grading from pure limestone to limy shale. Iron and copper mineralization occurs in impure limestones and limy shales.
3. Tuffaceous units which in places are difficult to distinguish from greywackes and vice versa.

All of the above rock types are intercalated and commonly have been metamorphosed to coarse grained marbles and calc-silicate rocks.

In the Greenwood area very significant copper-gold-silver mineralization occurs in the Brooklyn Formation. The ore deposits are restricted to what has been previously classified as 'skarn' (1,38,41,45,56,57,59,60). It was believed that certain stratigraphic horizons, comprising porous limy sediments, were more susceptible to hydrothermal fluids emitting from a mineralizing intrusion, resulting in the formation of calc-silicate skarns and iron and copper mineralization, that is, 'contact metasomatic' deposits. However the author of this report supports a different view, summarized by Peatfield (p 185) as follows:

"...the deposits are stratabound metamorphic, probably originally sedimentary concentrations of copper and iron in limey [sic] shales associated with the landward edges of limestone reefs, or located in 'pools' within reefal accumulations."

These Triassic deposits are generally stratabound and are occasionally stratiform (e.g. EMMA and north end of the BROOKLYN). The deposits have been deformed tectonically, to varying degrees, by faults and folds and cut by intrusive rocks. Pyrite, chalcopyrite, hematite and magnetite are the common 'ore' minerals. Sphalerite occurs in the area of the CYCLOPS showing. Garnet, epidote, actinolite, calcite and quartz are the common 'gangue' minerals, with notable changes in relative amounts according to each particular camp.

Production figures for the main Triassic deposits are as follows:

	Tons	Cu %	Au oz./ton	Ag oz./ton
<u>PHOENIX CAMP</u> - Knob Hill, Old Ironsides, Stenwinder, Brooklyn, Idaho, Snowshoe, Rawhide, Gold Drop, Curlew, Monarch	30,278,000	0.85%	0.032	0.20
<u>DEADWOOD CAMP</u> - Motherlode, Sunset, Greyhound, Morrison	4,643,000	0.86%	0.038	0.16
<u>SUMMIT CAMP</u> - BC, Emma, Oro Denoro, Mountain Rose	<u>506,000</u>	<u>1.8%</u>	<u>0.023</u>	<u>0.65</u>
TOTAL	35,427,000	0.86%	0.033	0.20

Andesitic volcanic rocks of probable Jurassic age occur east of the Phoenix area, overlying the Brooklyn Formation. No economic mineral deposits are known to exist in these rocks. The Mesozoic rocks have undergone moderate folding, with a general north-south axial trace of slightly northward plunging open folds.

Intrusive 'Nelson' rocks of Cretaceous age do not seem to be genetically related, except through metamorphism, to the copper-gold-silver Triassic deposits. Porphyritic rocks of Cretaceous(?) age host copper mineralization at the CITY OF PARIS deposit (39), and are responsible for the copper-silver mineralization on the SAPPHO prospect (42).

Mineralized quartz veins of Cretaceous and/or Tertiary(?) age occur in the Greenwood area apparently with random areal distribution. The seven main deposits (DENTONIA, PROVIDENCE, SKYLARK, YANKEE BOY, NUMBER SEVEN, E PLURIBUS UNUM and LAST CHANCE) have produced 54,400 oz. of gold and 2,015,000 oz. of silver from 179,000 tons of ore.

During Tertiary times deposition of clastic sediments and volcanic flows and the intrusion of acidic to basic igneous rocks accompanied graben-like normal faulting (48).

PROPERTY GEOLOGY

STRATIGRAPHY

Chalcopyrite +/- hematite +/- pyrite +/- epidote +/- chlorite mineralization occurs in impure, recrystallized grey Triassic limestone near a regional limestone/clastic contact (Figure 3). The underlying (older ?) white limestone unit is generally massive, with some thin-bedded sections, and recrystallized. The overlying (younger ?) clastic unit appears to be both volcanic and sedimentary in origin. The volcanic rocks are tuffaceous with an andesitic matrix and contain quartz phenocrysts. Some of the rocks might be andesitic flows. Lithic fragments and rounded cherty clasts give other rocks a sedimentary appearance. Minor limy strata, probably lensoid are intercalated. These Triassic rocks are probably older than those to the east which host the majority of the Phoenix deposits (55).

A 2 metre wide, conformable rusty weathering pyritic hornblende porphyry occurs in places above the footwall of the stratiform copper-bearing limestone. On the north wall of the glory hole this rock is highly altered with abundant epidote, calcite and pyrite. Cherty or silicified rock occurs in places on the footwall of the porphyry and the porphyry is enclosed by a narrow envelope of dark limestone. This rock is either an altered volcanic rock or a later (Jurassic?) intrusive sill.

A flat dipping feldspar porphyry syenite dyke of early Tertiary age is well exposed in the east wall of the glory hole.

STRUCTURE

The Triassic rocks strike north and dip steeply to the east. The clastic rocks, being more competent than the limestones, are more fractured. This has resulted in greater physical erosion as noted in the trenches. Overburden is 0.5 metre deep over limestone, but about 2 metres deep over the clastic unit.

Numerous faults, with similar attitudes to the bedded rocks, have been mapped. Strike-slip (horizontal slickensides) and post-syenite normal (?) faulting occurs. The greatest width of shearing is about 3 cm on the fault truncating the Tertiary dyke.

ALTERATION

Slight to moderate chlorite, epidote and calcite alteration of impure grey limestones, hornblende porphyry and the clastic unit is common, with a notable decrease in alteration northward. Epidote occurs as clots and minor veinlets and calcite as coarse grained clots. There is some increase in epidote, calcite and hematite near faults.

MINERALIZATION

Rock samples, totalling 24, were collected and assayed, or geochemically analysed by Bondar-Clegg & Co. Ltd., for Au, Ag and/or Cu by standard methods. The results are shown on Table 1 and the sample locations are plotted on Figure 4. Two soil samples were also collected and analysed by standard geochemical methods for Cu, Au and Ag.

A narrow, banded chalcopyrite +/- hematite-bearing impure grey limestone, less than two metres thick, extends 35 m north of the glory hole. This rock unit, which pinches out to the north, is stratiform with the width and the mineralization of the zone apparently dependent on the original stratigraphy. This zone averages about one metre in width and grades 2.4% Cu, 0.1 oz./ton Au and 0.4 oz./ton Ag. The highest gold value is 0.47 oz./ton Au across 0.5 metres.

The hornblende porphyry unit only carries significant values near the north wall of the glory hole where the unit contains abundant pyrite, epidote and calcite. A 2.6 metre wide sample ran 0.070 oz./ton Au, with very little copper. The porphyry generally contain 5% pyrite throughout.

The copper-bearing limestone east of the hornblende porphyry appears to end abruptly northward along strike. This zone ran 0.65% Cu, 0.095 oz./ton Au and 0.23 oz./ton Ag across 2.9 metres.

Another copper-gold zone is located east of the glory hole along the limestone/clastic contact. Two samples averaged 0.6% Cu and .08 oz./ton Au across 0.9 metres.

One sample of chert clast conglomerate is anomalous (.011 oz./ton) in gold content.

TABLE 1

SAMPLE NUMBER	SAMPLE TYPE	WIDTH m	Cu % or ppm*	Au oz./ton	Ag oz./ton or ppm*	COMMENTS
7351	grab	-	28*	.095	2.1*	impure limestone; epidote, calcite & py abundant
7352	grab	-	3.12	.044	.95	large block in pit; cpy in impure limestone & calcite veinlets
7353	chip	2.2	1.75	.044	.33	impure limestone; cpy, minor py & hem; 0.4 m on FW barren thin bedded limestone
7354	chip	2.6	194*	.070	0.4*	altered hornblende porphyry py, epidote, calcite
7355	chip	1.4	146*	<.002	0.2*	rusty & hematitic hornblende porphyry; py & epidote
7356	chip	2.2	88*	<.002	0.2*	similar to 7355
7357	grab	-	61*	<.002	0.3*	cherty rock; thin discontinuous py bands
7358	chip	0.5	2.04	.47	.22	impure limestone; cpy, mal
7359	chip	2.3	74*	<.002	0.2*	similar to 7355
7360	chip	0.9	3.62	.078	.48	impure limestone; cpy, mal; HW cherty rock, py
7361	chip	2.2	430*	<.002	0.2*	similar to 7355
7362	chip	0.7	3.36	.070	.58	impure limestone; cpy, mal
7363	chip	2.0	-	.022	0.5*	similar to 7355
7364	chip	1.0	680*	.13	1.2*	similar zone to 7363 except in soft highly weathered zone
7365	grab	-	-	<.002	0.2*	tuff; hematite on fractures

SAMPLE NUMBER	SAMPLE TYPE	WIDTH m or	Cu % ppm*	Au oz./ton	Ag oz./ton or ppm*	COMMENTS
7366	grab	-	-	<.002	0.2*	flow rock or very f.g. tuff; minor py
7369	chip	0.5	1.55	.13	.48	in altered tuff at limestone contact
7370	grab	-	-	.011	0.3*	chert conglomerate; andesitic matrix
7371	grab	-	-	.002	0.3*	limy tuff; 10% py
7373	chip	1.6	162*	<.002	1.0*	similar to 7355
7375	grab	-	-	.002	0.2*	tuffaceous rock; 5% py
71876	grab	-	-	<.002	.04	tuffaceous greywacke; 5% py
71877	chip	1.2	0.23	.056	.09	impure, rusty limestone; cpy, mal on FW
71880	chip	2.9	0.65	.095	.23	impure limestone; cpy

DISCUSSION & CONCLUSIONS

Geological mapping and rock sampling on the BROOKLYN show that significant copper-gold mineralization occurs on surface in the area of former mining activity. The copper-gold mineralization appears to be geologically related to impure limestones near a limestone/clastic contact. The mineralization is both stratiform and stratabound. The stratabound mineralization reflects facies changes and/or remobilization during metamorphism. Earlier drilling and this year's work have discovered gold zones, without copper mineralization. These zones might indicate gold remobilization and deposition related to later thermal metamorphism. Sampling of soil and weathered outcrop indicates that there is enrichment of copper, gold and silver at the weathered surface.

A study of previous work indicates that much exploration was carried out without regard to gold mineralization. Gold mineralization has shown to be very significant on the BROOKLYN. The presence of more deposits along strike and/or down dip has not been thoroughly evaluated.

RECOMMENDATIONS

Before any major exploration is carried out on the BROOKLYN the following program is recommended.

1.) A complete geological, stratigraphic, structural and economic minerals study and evaluation of the Phoenix Camp should be completed.

2.) A complete study of the BROOKLYN and IDAHO deposits should be carried out. A thorough understanding of ore controls will be necessary to aid further exploration.

Any further work would depend on the results of the above programme.

Respectfully submitted,



W. R. Gilmour

November 17, 1981

Vernon, B.C.

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27.	- - -	1933	p 160
28.	- - -	1934	p D8
29.	- - -	1936	p A34, D55
30.	- - -	1937	p A36, D33
31.	- - -	1938	p A39, D18
32.	- - -	1939	p 42, 90
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Statement of Costs

1.	Professional Services W.R. Gilmour, geologist, Field work Sept. 16-18 Oct. 2-3 and report writing	9 days @\$200.00/diem	\$1,800.00
2.	Labour Craig Lynes Sept. 16-18	3 days @\$100.00/diem	300.00
3.	Transportation 4 x 4 vehicle Sept. 16-18, Oct. 2 4 days @ \$25.00/diem 795 km @ \$.20/km Gas, oil	\$100.00 159.00 102.80 <hr/> \$361.80	361.80
4.	Accommodation, Meals Sept. 16-18, Oct. 2-3		164.46
5.	Analysis Rock Geochem 15 copper @\$0.75 21 silver @ \$1.75 Rock Assays 8 copper @\$6.00 9 gold, silver @\$11.00 15 gold @\$8.00 Soil Geochem 2 copper @\$0.75 2 gold @\$5.25 2 silver @\$1.75 Sample Preparation 24 @\$2.50 2 @\$0.60	36.75 11.25 48.00 99.00 120.00 1.50 10.50 12.25 60.00 1.20 <hr/> 400.45	400.45
6.	Field supplies; Shipping		100.00
7.	Telephone, Printing, Secretarial		<u>350.00</u>
			<u>\$3,476.71</u>

STATEMENT OF QUALIFICATIONS

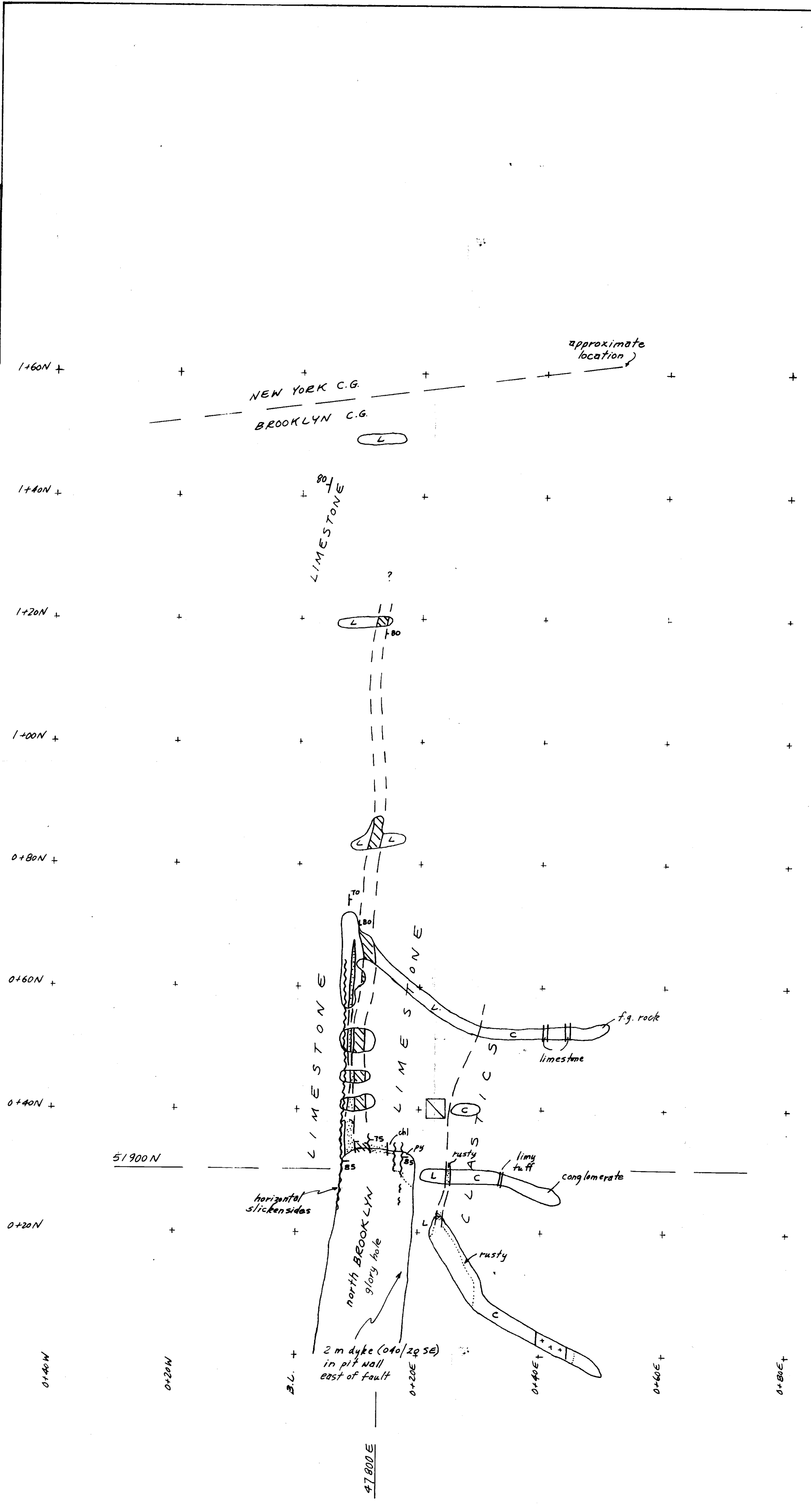
I, W. R. GILMOUR, of 13511 Sumac Lane, Vernon, B.C., V1B 1A1,
DO HEREBY CERTIFY that:

1. I am a consulting geologist in mineral exploration employed by W.R. Gilmour & Associates Ltd., Vernon.
2. I have been practising my profession in British Columbia, the Yukon Territory, and Nevada for 11 years.
3. I am a graduate of the University of British Columbia with a Bachelor of Science degree in geology.
4. I am a Fellow of the Geological Association of Canada and a member of the Society of Mining Engineers of A.I.M.E.
5. This report is based upon knowledge of the BROOKLYN property gained from exploration work on the property.
6. I am a Director of Kettle River Resources Ltd.



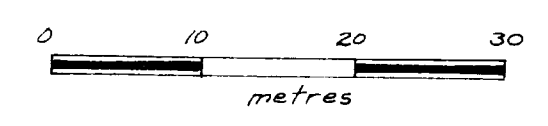
W. R. Gilmour

Vernon, B.C.
November 17, 1981

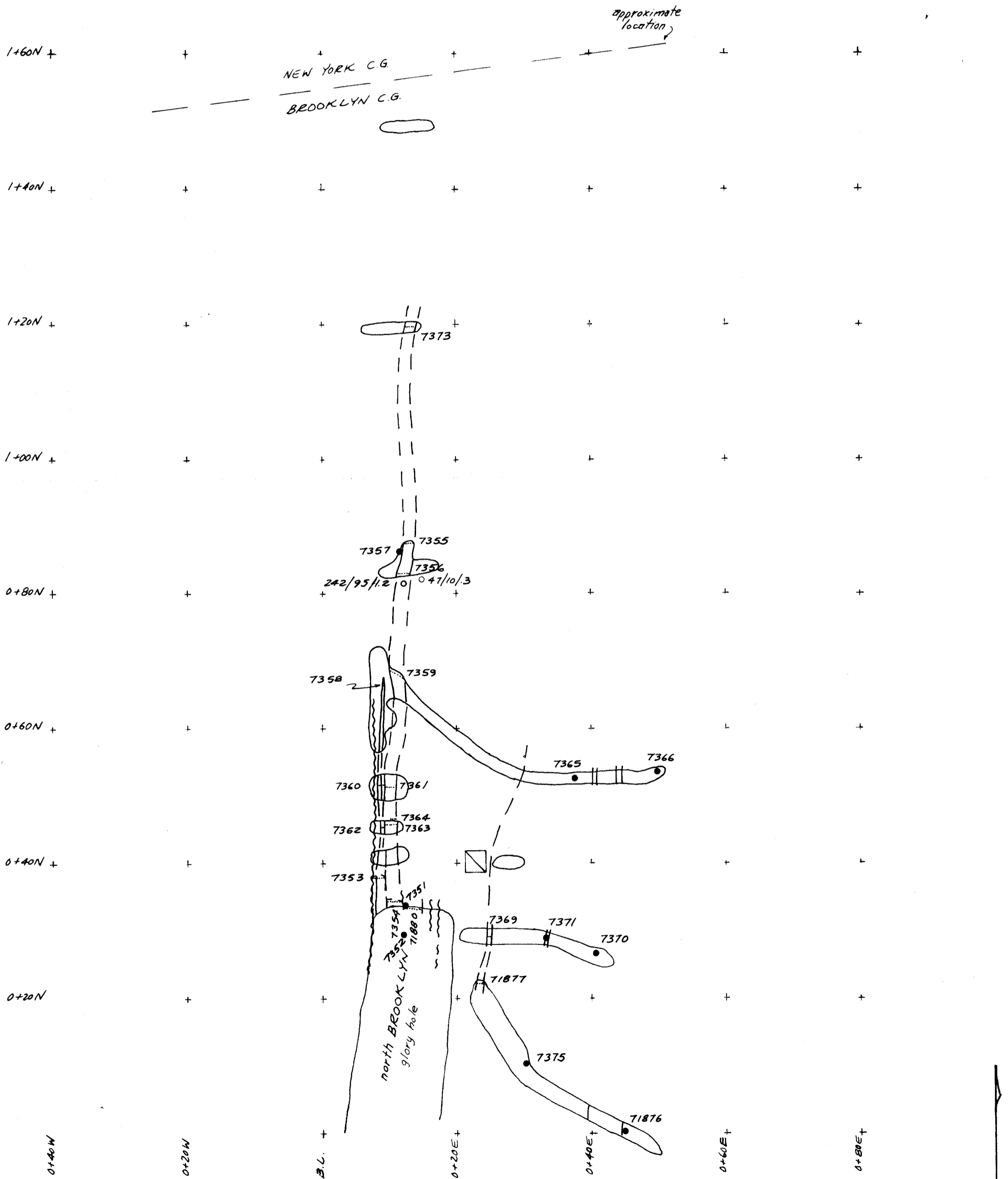


- TERTIARY feldspar porphyry syenite dyke
- TRIASSIC ? hornblende porphyry (sill or flow)
rusty (py, hem) with ep
increase alteration (ep, cal) by glory hole
- TRIASSIC LIMESTONE: white, commonly metamorphosed to marble
- impure, recrystallized limestone with discontinuous banded sulphides.
cpy, hem, py, ep, chl, mal present
- CLASTICS: green, hard, non-limy rocks
tuff, grey wacke, conglomerate (chert clasts)
& andesitic flows(C)
- cpy chalcopyrite
- py pyrite
- hem hematite
- ep epidote
- chl chlorite
- mal malachite
- fault
- geological contact
- rock exposure
- trench
- raise
- 51900N Granby mine grid - approximate location

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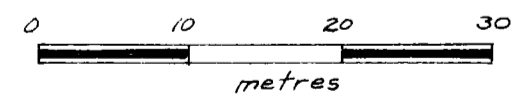
KETTLE RIVER RESOURCES LTD.	
K. L. DAUGHTRY & ASSOC. LTD.	
GEOLOGY	
BROOKLYN MINE	
GREENWOOD M.D.	82E/2E
SCALE: 1:500	DATE: OCTOBER 1981
DWN. BY: WRS	PROJ. N° 135 FIG. N° 3



- rock chip sample
- rock grab sample
- soil sample : ppm Cu / ppb Au / ppm Ag

see Fig. 3 for geology
Table 1 for results

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