

ASSESSMENT REPORT

on the

CYCLOPS PROPERTY

CLAIMS: CYCLOPS, PRADO #1 FR,  
SILVER CHIEF FR, SUPERCHIEF FR

SUMMIT CAMP

GREENWOOD MINING DIVISION

NTS: 82E/2E

Latitude: 49°07.3' North

Longitude: 118°33.3' West

Owner: Noranda Exploration Co. Ltd.

Operator: Kettle River Resources Ltd.

Consultant: K.L. Daughtry & Associates Ltd.

Author: W.R. Gilmour

Date: June 28, 1982.

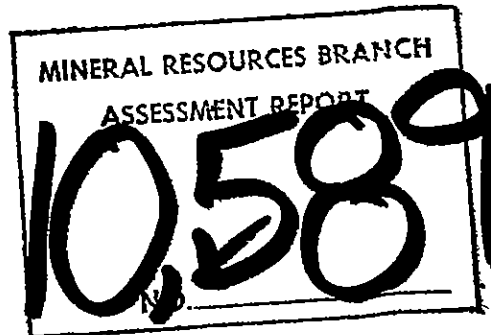


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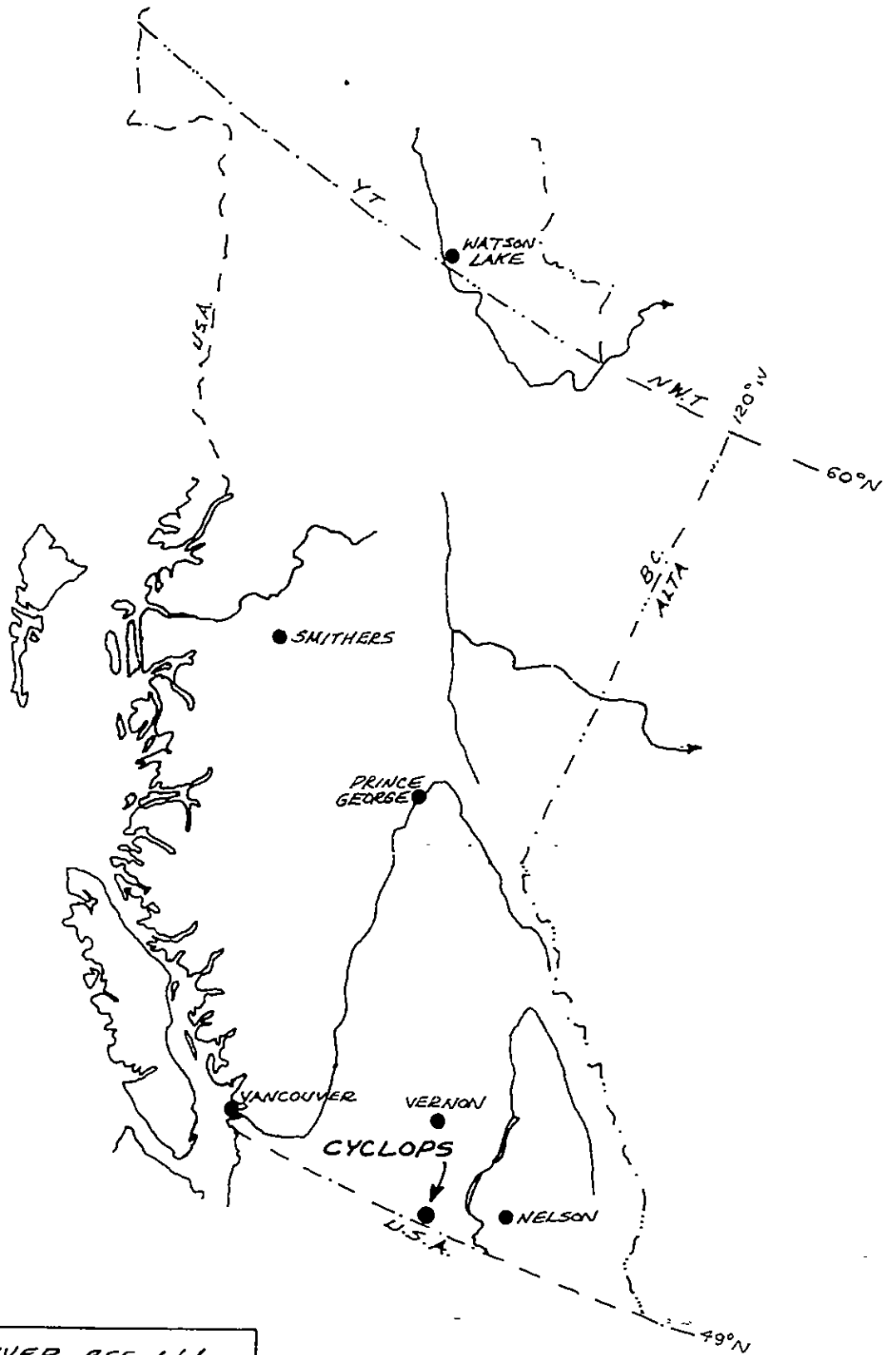
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SUMMARY

This report describes the results of a geological mapping and sampling programme on the Cyclops property during the fall of 1981 and the spring of 1982. Mapping was carried out at a scale of 1:1000 and 1:500. A total of 15 rock samples were collected and assayed or geochemically analysed for zinc, lead, copper, gold and/or silver.

Stratiform zinc mineralization with minor lead and silver occurs on the property. Although the grade and width are of significance the tonnage potential is not good.

An area of 300 m of strike length between the Cyclops showing and the ORO DENORO claim is covered by till. An exploration programme on this part of the property is recommended.



KETTLE RIVER RES. LTD.

K. L. DAUGHTRY & ASSOC. LTD.

LOCATION MAP  
CYCLOPS PROPERTY

JUNE, 1982

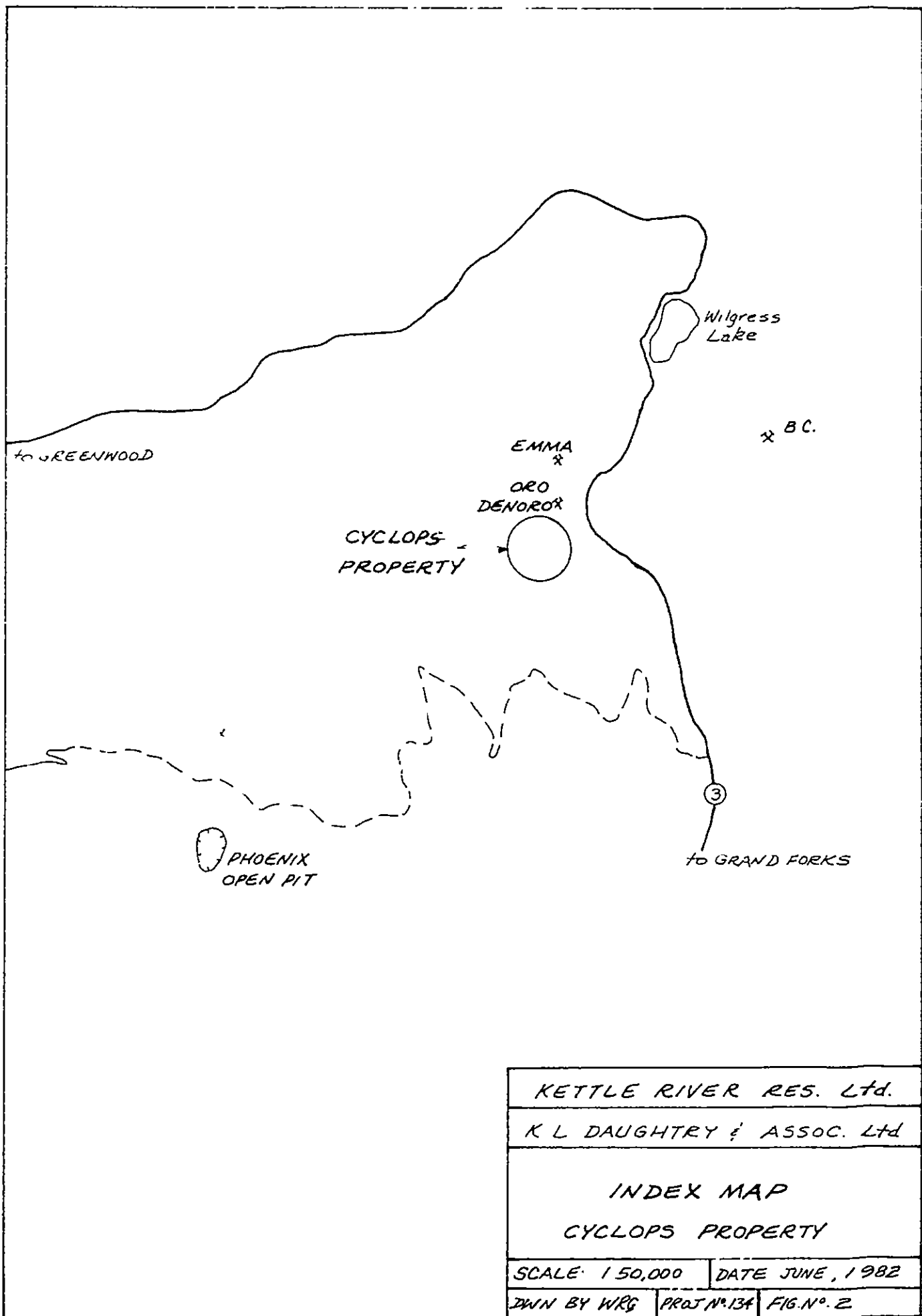
FIG. NO. 1

LOCATION, ACCESS, AND TOPOGRAPHY

The Cyclops property is located 10 km ENE of Greenwood, in the Summit Camp of the Boundary District of south-central British Columbia (Figure 2). The Cyclops property covers the ground between the ORO DENORO to the north and the LANCASHIRE LASS to the south, a distance of 700 metres. The center of the claims is at  $49^{\circ}07.3'$  N. Latitude and  $118^{\circ}33.3'$  W. Longitude. The National Topographic System map reference is 82E/2E.

Good access is provided by gravel roads, many of them old railroad grades, from Highway 3, a short distance to the east of the Cyclops.

The elevation varies from 1050 to 1200 metres and the topography slopes moderately to the northeast. Much of the property has recently been logged.



KETTLE RIVER RES. LTD.	
K L DAUGHTRY & ASSOC. LTD	
INDEX MAP	
CYCLOPS PROPERTY	
SCALE: 150,000	DATE JUNE, 1982
DWN BY WRG	PROJ. NO. 134 FIG. NO. 2

PROPERTY

The following claims cover the area of interest between the ORO DENORO and the LANCASHIRE LASS (Figure 5).

<u>CLAIM NAME</u>	<u>Record No.</u>	<u>Expiry Date</u>	<u>Registered Owner</u>
CYCLOPS	20028	July 6, 1983	Noranda Exploration Company Limited (no personal liability)
PRADO #1 Fr	37058	April 4, 1984	Noranda Exploration Company Limited (no personal liability)
SILVER CHIEF FR	20029	July 7, 1984	Noranda Exploration Company Limited (no personal liability)
SUPERCHIEF Fr	37188	June 4, 1983	Noranda Exploration Company Limited (no personal liability)

These claims are part of the CYCLOPS 82 Group.

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

HISTORY

The first record of work is in 1899 when a CYCLOPS claim was Crown-granted (Lot 1244) to John F. Hall et al (1).

In 1950, New Jersey Zinc drilled 1600 feet of diamond drilling (8 holes) indicating 5000 tons grading 8-10% zinc (2,8).

In 1952, Silver Chief Mines carried out underground exploration and mining as follows:

"An adit level was driven 130 feet in a southerly direction. At a point 100 feet from the portal a raise was driven 18 feet to connect with the bottom of an old shallow shaft. From this development work, 285 tons of ore was mined.... The [mineralized zone] ranged from 2 to 12 feet in width, and the ore milled averaged 5.9 percent zinc, with a small content of lead." (B.C.D.M. Annual Report, p 141)

In 1967, Giant Explorations Ltd., a subsidiary of Giant Mascot Mines Ltd., carried out a bulldozer trenching programme, comprising 5 trenches totalling 430 feet. Three shallow adits were also dug (3). The following year the company carried out a programme of geological mapping, a soil geochemical survey for zinc and copper, and a ground magnetometer survey (4,12). The magnetometer survey showed a marked increase in gradient along the marble/gabbro contact, with values increasing eastward. The mineralized zone was indicated by anomalous zinc values in soils (12).

In 1974 Granby Mining carried out geological mapping and a magnetometer survey over the Cyclops as part of a larger survey covering the Summit Camp. In 1975, as part of a similar large survey, a weak, short Turam E.M. anomaly was discovered over the Cyclops zinc zone.



WORK PROGRAMME 1981 - 82

Upgrading of a picket grid and a programme of backhoe trenching was carried out in the fall of 1981. Geological mapping and rock sampling was started then and completed the following spring.

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 (10); '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 ultramafic rocks of probable Permian age (10) commonly occur in the area. Minor platinum (SAPPHO), chromium and nickel showings are related or occur in these generally serpentized 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 (11). The Brooklyn Formation comprises three main rock types: (10)

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'. 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 variation in relative amounts according to each particular camp.

Production figures for the main Triassic deposits are as follows:

	<u>Tons</u>	<u>Cu</u> <u>%</u>	<u>Au</u> <u>oz/ton</u>	<u>Ag</u> <u>oz/ton</u>
<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 (5), and are responsible for the copper-silver mineralization on the SAPPHO prospect (7).

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 (9).

PROPERTY GEOLOGY & MINERALIZATION

A zone of chalcopyrite, magnetite and/or sphalerite mineralization in the Brooklyn Formation extends from the LANCASHIRE LASS northerly to the JUMBO, a distance of about 2 km. This 'Oro Denoro trend' appears to be stratigraphically controlled, although the type and tenor of mineralization varies greatly.

Rock samples, totalling 15, were collected and assayed, or geochemically analysed, by Bondar-Clegg & Co. Ltd., for Zn, Pb, Cu, Au and/or Ag by standard methods. The results are shown on Table 1 and the sample locations are plotted on Figures 4S, 4N. Geological mapping was carried out at a scale of 1:1000 and 1:500 (Figures 3S,3N,5).

On the Cyclops property, recrystallized limestones (marble) of the Brooklyn Formation are the dominant Triassic rocks. The top of the sharpstone conglomerate outcrops about 400 m to the west. Siliceous, argillaceous bands up to 2 cm wide are interbedded with the limestones. A narrow, sedimentary-looking limestone breccia with a green matrix occurs northwest of the shaft. The Brooklyn rocks are slightly overturned, dipping about 80° to the west and striking NNE.

Locally overlying the relatively pure limestone is a zone of zinc-rich argillaceous and limy rocks. The zone is about 3 m wide and at least 60 m in length (Figure 3S). Just south of line 64S a bed of massive green sphalerite, about 10 to 20 cm wide, is exposed for a length of 15 metres. Disseminated mineralization also occurs, with both green and brown sphalerite being noted together. Erratic lead mineralization is also present. The zone contains essentially no gold or copper and only minor silver. Overlying the zinc zone is

a narrow unit of marble. The rocks are thinly bedded in places with marble and calc-silicate altered argillaceous bands. Minor actinolite was noted. To the south by line 68S massive magnetite iron formation and minor copper mineralization occurs. The magnetite bed, containing minor calcite, is 40 cm in width. In the area of the CYCLOPS/ORO DENORO boundary (Figure 3N) both sphalerite and copper/silver mineralization was noted.

The calc-silicate rock is green and occasionally brown, hard and massive. Garnet with epidote, calcite and hematite are the main constituents. This 'skarn' unit is generally stratigraphically controlled. Minor breccia units occur at marble/calc-silicate contacts and near line 72S a small sharp embayment of calc-silicate in marble was noted (Figure 3S).

A sill-like body of gabbro about 400 m thick intrudes Brooklyn rocks adjacent to the mineralized zone. The rock is fine grained and a dark grey colour with a slightly coarser grained phase near the contact. Church (6) states that the rock contains about 55% plagioclase and 20% pyroxene grains set in a matrix of chlorite and disseminated magnetite. The gabbro had previously been mapped as tuff, andesite, diorite and basalt. The intrusion postdates the metamorphism of the Brooklyn Formation and in fact impinges a narrow hornfels zone on the calc-silicate rocks.

A few dykes of probable Tertiary age were noted.

A soil sample taken over the zinc zone (Figure 4S) shows that zinc (910 ppm) and lead (85 ppm) soil surveys should delineate the zone. Copper (13 ppm), silver (0.2 ppm) and gold (<5 ppb) are very low. Previous work (12) had indicated a zinc anomaly in soils east of the showing. This coincides with the base of a slope and is underlain by gabbro. It is probably a transported anomaly.

TABLE 1 - ROCK SAMPLING

SAMPLE NUMBER	SAMPLE TYPE	WIDTH m	Cu % or ppm*	Au oz/ton	Ag oz/ton	Zn %	Pb % or ppm*	COMMENTS
7374	selected grab	-	10*	.003	.15	30.0	189*	massive green sphalerite
71878	chip	0.4	.02	.003	.04	<.01	-	massive magnetite
71879	grab	-	-	.002	.04	<.01	-	limy calc-silicate rock
73032	grab	-	-	<.002	<.02	-	-	thin siliceous argillite beds 2% py
73033	chip	2.3	.01	<.002	.02	.06	-	calc-silicate rock
73034	grab	-	-	<.002	<.02	-	-	limestone sedimentary breccia
73035	chip	0.7	-	.002	.29	10.35	3.90	argillaceous, limy sediments, +/- calc-silicate bands; sp, ga
73036	chip	1.1	-	<.002	.06	2.80	0.19	argillaceous, limy sediments; sp
73037	chip	1.8	0.01	.002	.13	16.00	0.50	argillaceous, limy sediments; sp
73038	chip	1.2	-	<.002	<.02	1.96	0.01	argillaceous, limy sediments: sp
73039	chip	1.4	-	-	-	.11	-	hard, massive, garnet-rich calc-silicate rock
73040	selected grab	-	4.30	.008	.81	-	-	from adit, calc-silicate rock
73041	chip	2.0	.28	.004	-	232*	-	rusty oxidized, calc-silicate rock; mal, mag
73042	selected grab	-	-	.002	.29	9.20	2.45	limy sediments; sp, ga
73043	selected grab	-	-	<.002	.03	11.00	-	limy calc-silicate rock, green sp



DISCUSSIONS & CONCLUSIONS

Green sphalerite occurs as a distinctive bed and disseminated in limy argillaceous rocks. Bedded iron formation is also present. This zone marks a change in geological environment from relatively pure limestone to metal-rich sediments. The stratiform nature of much of the zinc and iron mineralization as well as the low gold and silver content indicates syngenetic mineral deposition. A small basin with zinc grading outward to magnetite and copper is suggested. Copper mineralization near the ORO DENORO is typical of the Summit Camp, with lower gold and higher silver values than the Phoenix area.

The Brooklyn rocks have undergone metamorphism, the limestone to marble and limy argillaceous rocks to calc-silicate rocks. This 'skarn' unit probably represents metamorphism of a limy clastic rock, with little introduced 'metasomatic' components. Brecciation along the marble/calc-silicate contact is due either to faulting and/or mobilization of calc-silicate minerals during metamorphism.

The occurrence of the gabbro sill-like body adjacent to the mineralized zone is probably not coincidental, but may be related to intrusion of more competent rocks. The stratigraphy has been complicated by the gabbro although the metamorphic effect seems to be minimal. It is not known to what extent the gabbro has possibly assimilated significant mineral deposits.

The grade (7% Zn+Pb), and width (3 metres), of the zone are of economic interest. However, the limited strike length makes the potential for significant tonnage small.

An area on the CYCLOPS of about 300 m in strike length is covered by till,

with no rock exposure. There is no record of drilling in this area and a thick till blanket could have masked an 'Oro Denoro' type deposit from past geophysical surveys. It should be noted that the gabbro contact to the north appears to be swinging eastward, possibly allowing for the presence of significant mineralization along the favourable stratigraphic horizon.

REFERENCES

1. B.C.D.M. Annual Report 1899 p 848
2. B.C.D.M. Annual Report 1952 p 141
3. B.C.D.M.P.R. Annual Report 1967 p 233
4. B.C.D.M.P.R. Annual Report 1968 p 235
5. Church, B.N. 1970 in B.C.D.M.P.R.--GEM, p 413-425
6. Church, B.N. 1982 in G.A.C. Copper Mountain-Phoenix Tour, p 29-39
7. Gilmour, W.R. 1981 Assessment Report on the Sappho Property, Norwegian Creek, Greenwood M.D.
8. Granby Mining Company - various unpublished private reports
9. Monger, J.W.H. 1968 G.S.C. Paper 67-42
10. Peatfield 1978 Geologic History and Metallogeny of the Boundary District, Southern B.C. and Northern Washington, Queen's University, Ph.D. Thesis
11. Seraphim, R.H. 1956 in C.I.M.M. Transactions Vol. 59, p 384-394
12. Wilson, D.M. 1968 Assessment Report 1580

Statement of Costs

1.	Professional Services W.R. Gilmour, geologist Field work Sept. 19, Oct. 3 June 2-5 and report writing	9 days @\$200.00/diem	\$1,800.00
2.	Labour Craig Lynes Sept. 19	1 days @\$115.00/diem	115.00
3.	Transportation 4 x 4 vehicle Sept. 19, Oct. 3 June 2-5 6 days @ \$30.00/diem 690 km @ \$.30/km Gas, oil	\$180.00 207.00 <u>64.00</u>	
		\$451.00	451.00
4.	Accommodation, Meals Sept. 19, Oct. 1-3 June 2-5		296.21
5.	Analyses Rock Geochem 1 copper, zinc @\$2.80 1 copper, zinc, lead @\$3.70 Rock Assays 5 copper @\$6.50 13 gold, silver @\$12.50 1 gold @\$9.00 5 lead, zinc @\$14.00 6 zinc @\$7.00 Soil Geochem 1 copper, gold, silver lead zinc @\$10.60 Sample Preparation 2 @ \$2.75 1 @ \$.70	2.80 3.70 32.50 162.50 9.00 70.00 42.00 10.60 5.50 <u>.70</u>	
		339.30	339.30
6.	Field supplies; Shipping		85.00
7.	Telephone, Printing, Secretarial		<u>275.00</u>
		Total	\$ 3,361.51

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 Cyclops property gained from exploration work on the property.
6. I am a Director of Kettle River Resources Ltd.



W. R. Gilmour

Vernon, B.C.  
June 28, 1982

RECOMMENDATIONS

The following programme on the Cyclops property is recommended.

1. Before any major exploration is carried out the LANCASHIRE LASS-CYCLOPS-ORO DENORO-EMMA-JUMBO deposits should be evaluated in terms of the geological study of the Phoenix Camp now being undertaken.
2. Assuming that an 'Oro Denoro' or 'Emma' type deposit would be of economic significance, the area of till cover represents a good geological target and should be tested by drilling.

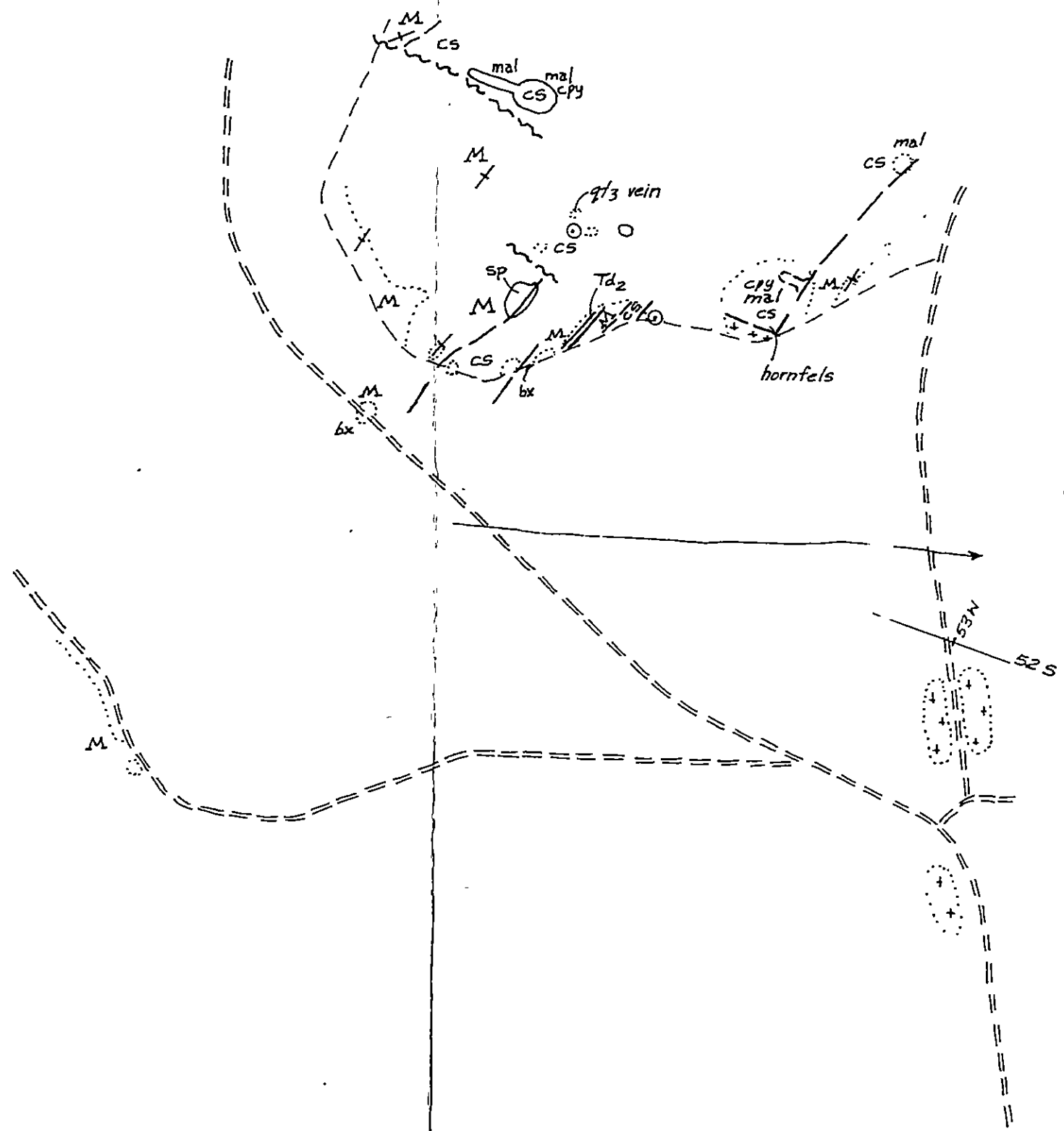
Respectfully submitted



W.R. Gilmour

June 28, 1982

Vernon, B.C.



See Figure 35 for legends

MINERAL RESOURCES BRANCH  
ASSESSMENT REPORT

metres

**10,589**

KETTLE RIVER RESOURCES Ltd.	
K.L. DAUGHTRY & ASSOC Ltd.	
<b>GEOLOGY</b>	
CYCLOPS PROPERTY	
GREENWOOD M.D.	82E/2E
SCALE: 1:1000	DATE: JUNE, 1982

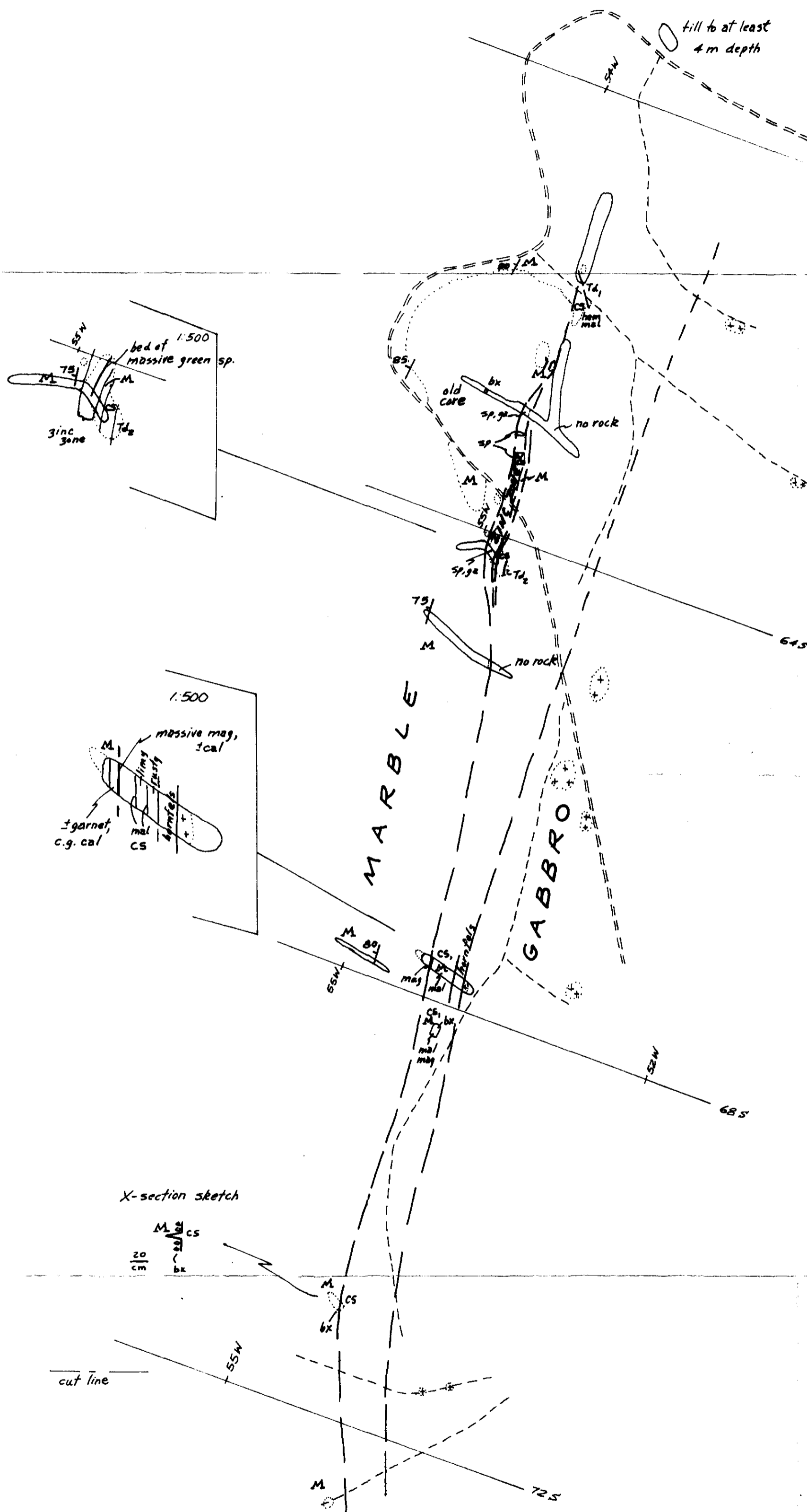


see Figures 35, 45 for legends

MINERAL RESOURCES BRANCH  
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 ASSESSMENT REPORT  
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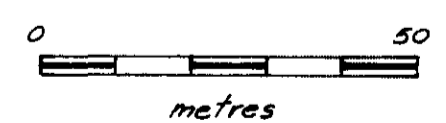
KETTLE RIVER RESOURCES Ltd.		
K.L. DAUGHTRY & ASSOC Ltd		
<b>ROCK SAMPLING</b>		
<b>CYCLOPS PROPERTY</b>		
GREENWOOD M D		82E/2E
SCALE: 1:1000	DATE JUNE, 1982	
DWN. BY: WRG	PROJ N° 134	FIGURE N° 4N





- TERTIARY**
- T4z fg. pale grey-green dyke; small feldspar phenocrysts
  - T4f feldspar porphyry syenite dyke
- JURASSIC?**
- J+ gabbro
- TRIASSIC**
- CS calc-silicate rock: hard, green, massive, garnet-rich
  - ZINC ZONE: mainly argillaceous limy rocks, distinctly bedded; massive (green) sp to disseminated (green & brown) sp, ± ga
  - M marble: white, recrystallized limestone, with thin siliceous argillaceous beds
- sp sphalerite  
ga galena  
mag magnetite  
hem hematite  
mal malachite  
cal calcite
- bx breccia  
- geological contact  
■ shaft  
| adit  
= road  
- - old road/cat road  
○ trench, old workings  
○ rock exposure  
| bedding attitude  
○ old drill hole  
~ fault

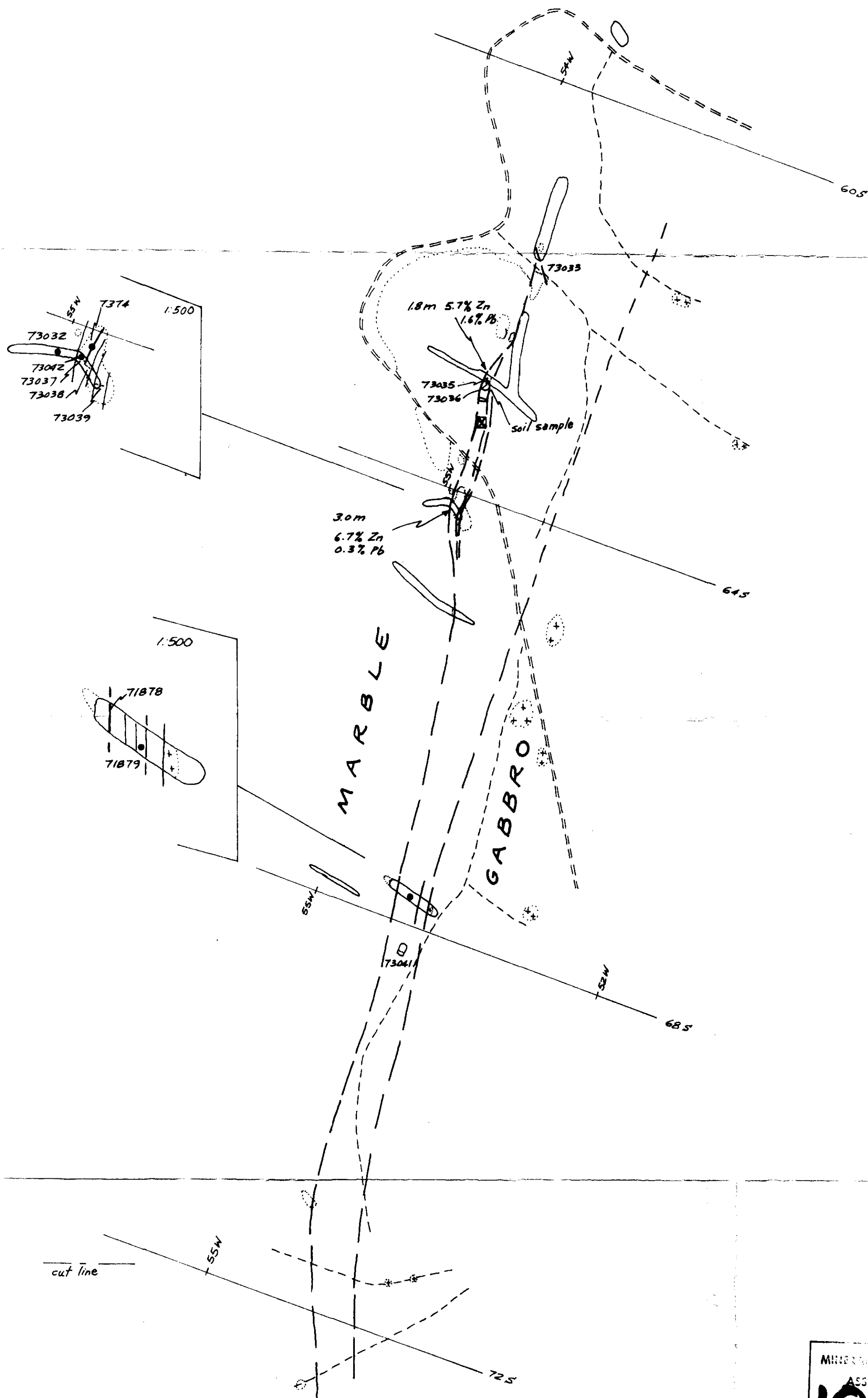
N.B. grid in feet



MINERAL RESOURCES DIVISION  
ASSESSMENT REPORT  
**10,589**



KETTLE RIVER RESOURCES LTD.	
K. L. DAUGHTRY & ASSOC. LTD.	
<b>GEOLOGY</b>	
<b>CYCLOPS PROPERTY</b>	
GREENWOOD M.D.	824/26
SCALE: 1:1000	DATE: JUNE, 1982
DWN BY: NRG	PROJ. N°: 134
	FIGURE N°: 3.5



— rock chip sample  
● rock grab sample

see Figure 3S for geology  
& Table 1 for results



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ASSESSMENT REPORT  
**10589**  
No.



KETTLE RIVER RESOURCES LTD.	
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<b>ROCK SAMPLING</b>	
<b>CYCLOPS PROPERTY</b>	
GREENWOOD M.D.	82E/25
SCALE: 1:1000	DATE: JUNE, 1982
DWN BY: NRG	PROJ. N°: 134 FIGURE N°: 45



N.B. - base map after  
McElhanney, 1969  
- elevations in feet

KETTLE RIVER RESOURCES Ltd.		
K. L. DAUGHTRY & ASSOC. Ltd.		
<b>GENERALIZED GEOLOGY</b>		
<b>CYCLOPS PROPERTY</b>		
GREENWOOD M.D.	82E/2E	
SCALE: 1:5000	DATE: JUNE, 1982	
DWN. BY: WRG	PROJ. NO: 134	FIGURE NO: 5

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