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NICK PROPERTY
YUKON TERRITORY

NDU RESOURCES LTD.
PAK-MAN RESOURCES INC.
2001 RESOURCE INDUSTRIES LTD.

October 16, 1989

R.C. Carne, B.Sc., M.Sc.

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SUMMARY AND RECOMMENDATIONS

The Nick property, located in central Yukon, hosts a newly discovered and highly unusual type of stratiform, shale-hosted nickel-molybdenum-platinum mineralization. The only similar mineralization reported in geological literature is being mined in southern China.

The Nick mineralization occurs in an erosional outlier of Selwyn Basin that is surrounded by carbonate rocks of the Mackenzie Platform. The mineralized horizon lies at the transition between underlying calcareous shales and overlying phosphatic chert and non-calcareous shale. The mineralization is composed of vaesite (NiS₂), pyrite, minor sphalerite and minor bitumen. It occurs as banded concretions, spherulites and framboids, disseminations and pelley aggregates up to 10 cm thick. Soft sediment slumping, bioturbation and/or dewatering of a chemical/biogenic precipitate have been suggested to explain the characteristically disrupted sulphide textures. The massive sulphide horizon has been traced intermittently for an exposed strike length of 100 km along the limbs of two synclinal troughs.

The Nick mineralization grades up to 5.8% nickel and is associated with a distinctive suite of trace metals, in particular: platinum (up to 700 ppb), palladium (300 ppb), silver (12.6 ppm), gold (86 ppb), rhenium (61 ppm), zinc (9600 ppm), molybdenum (2650 ppm), arsenic (2990 ppm) barium (3000 ppm) and selenium (4500 ppm). At current metal prices, Nick mineralization grading 3 to 5% Ni has a gross value of more than \$500 (Can.) per tonne.

The geological setting and chemistry of the vaesite-bearing horizon suggests derivation from Red Sea-type brines. The closest analogy to the Nick mineralization is probably the Howards Pass deposits where approximately 500 million tonnes of material grading 7.5% Zn+Pb have been outlined by drilling.

The reserves occur in three small sub-basins within a larger Silurian shale basin. Like the Nick area, the stratigraphic position of the sulphide mineralization is marked by a persistent, basin-wide, zinc-rich horizon overlain by phosphatic chert at the transition from calcareous to siliceous sedimentation.

The next phase of exploration should consist of detailed prospecting and stratigraphic mapping with follow-up hand trenching and diamond drilling in the search for sub-basins which may carry economic widths of mineralization.

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

/mc

R.C. Carne, B.Sc., M.Sc.

INTRODUCTION

The Nick property was acquired in 1988 by NDU Resources Ltd. (50%), Pak-Man Resources Inc. (25%) and 2001 Resource Industries Ltd. (25%) under an option agreement from a private syndicate. Inco Limited optioned the property in early 1989 and can earn a 60% interest by making exploration expenditures of \$2,500,000 before December 31, 1992. NDU has the option of participating in exploration and/or development after 1992 or diluting to a 1% NSR royalty.

Evidence for base metal mineralization in the area of the Nick property was first recognized in 1977 when GSC Open File 418 reported strongly anomalous values for nickel, zinc, molybdenum and barium from reconnaissance stream sediment samples taken from creeks draining an 18 km long by 5 km wide erosional remnant of Devonian black shale. The Nick mineralization was discovered in 1981 by Cominco geologists investigating the area for sedex lead-zinc-barium deposits. A specimen collected at that time from a 5 cm thick sulphide layer assayed 5.8% nickel and 0.8% zinc.

The showing was first staked by the Cooke Yukon Syndicate in March, 1988 and optioned to Archer, Cathro in May. NDU acquired the option in June and entered into a joint venture with Pak-Man and 2001 in August which carried out a \$200,000 program of geological mapping, geochemical sampling and diamond drilling (362 m in 4 holes) around the discovery area in September. Inco, in turn, optioned the property from the joint venture in July, 1989 and carried out a \$500,000 work program including additional claim staking (to total 182 claims), detailed geochemical sampling, prospecting and geological mapping, plus 891 m of diamond drilling in 13 holes. Results of the 1989 work are confidential to Inco and are not discussed in this report.

LOCATION AND ACCESS

The main showing area is located at 64°43'N and 135°13'W, within NTS claim sheet 106D/11 near the headwaters of the Hart River (see Figures 1 and 2). It lies about 12 km northwest of an airstrip at Hart Lake which accommodates aircraft as large as the DC-3. Access is by helicopter from the airstrip or the closest road at McQuesten Lake, 70 km to the south. The Wind River winter road passes within 35 km of the property.

GEOLOGY AND MINERALIZATION

Stratiform nickel mineralization occurs at one stratigraphic interval within Devonian shales preserved in two parallel synclinoria (Figure 3). The southern trough is about 15 km long by 2 km wide while the northern trough, compressed by isoclinal folding and repeated by thrust faulting, covers an 18 km long by 1 km wide area.

The nickel-bearing shales occur in erosional remnants of a shale basin surrounded by carbonate rocks of Mackenzie Platform. A distinctive suite of Ordovician to Silurian graptolite-bearing calcareous shales and shaley limestone which underlies the Devonian siliceous shales is separated from age-equivalent reefal carbonates by normal faults (Figure 3). These form the margins of a 15 km wide graben that confines both the older shale facies and nickel-bearing Devonian shale.

The Devonian series is composed of a lower, dominantly siliceous, fine-grained sequence that is overlain by a brownish-weathering turbidite series. These two units closely resemble sequences assigned to the Lower and Upper Earn Group elsewhere in Yukon Territory. The GSC is currently carrying out conodont determinations to assign an age to the shale sequences.

The nickeliferous horizon occurs in a distinctive stratigraphic setting at

Figure 1

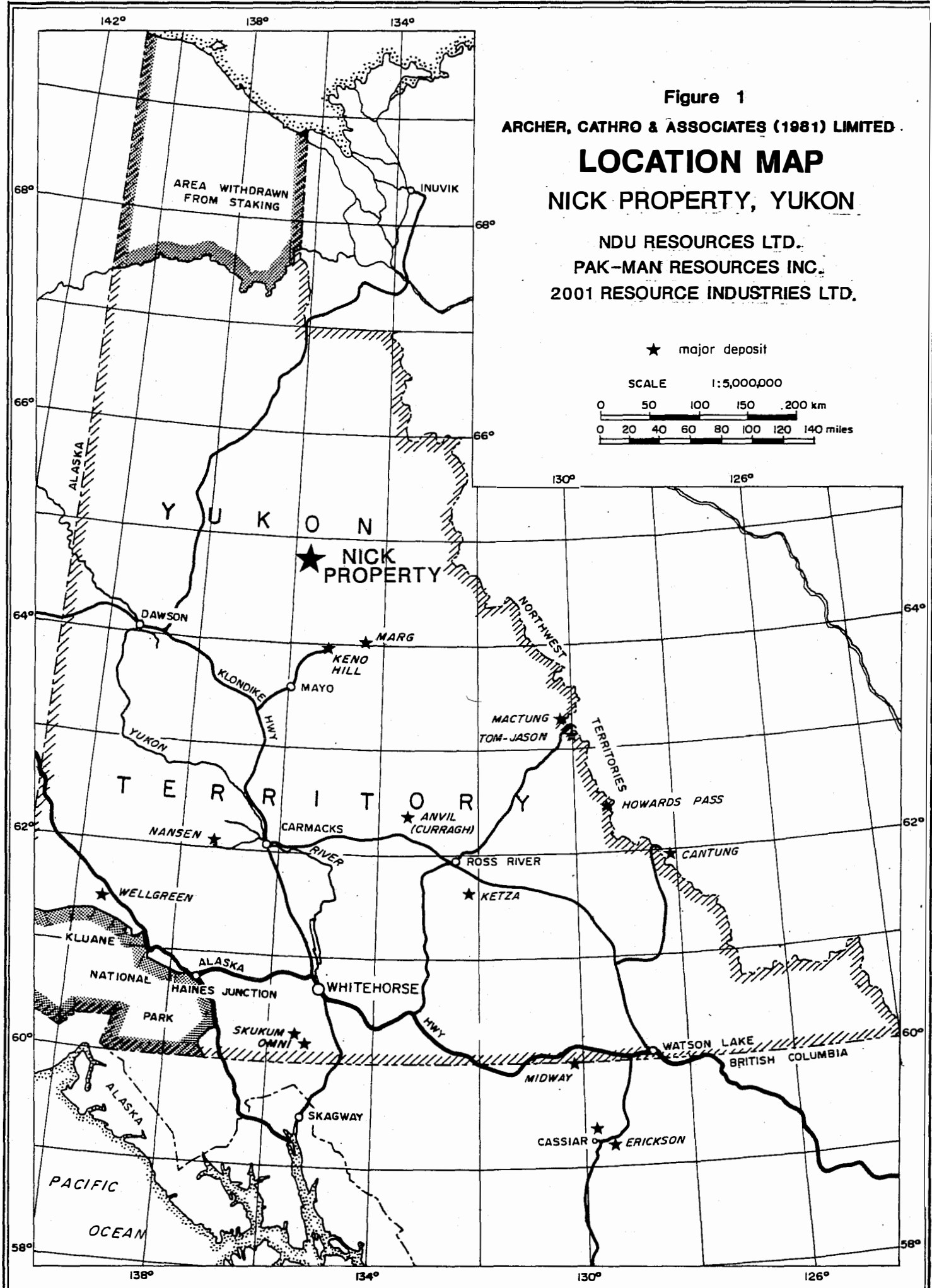
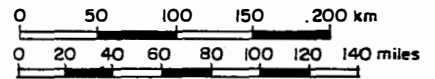
ARCHER, CATHRO & ASSOCIATES (1981) LIMITED.

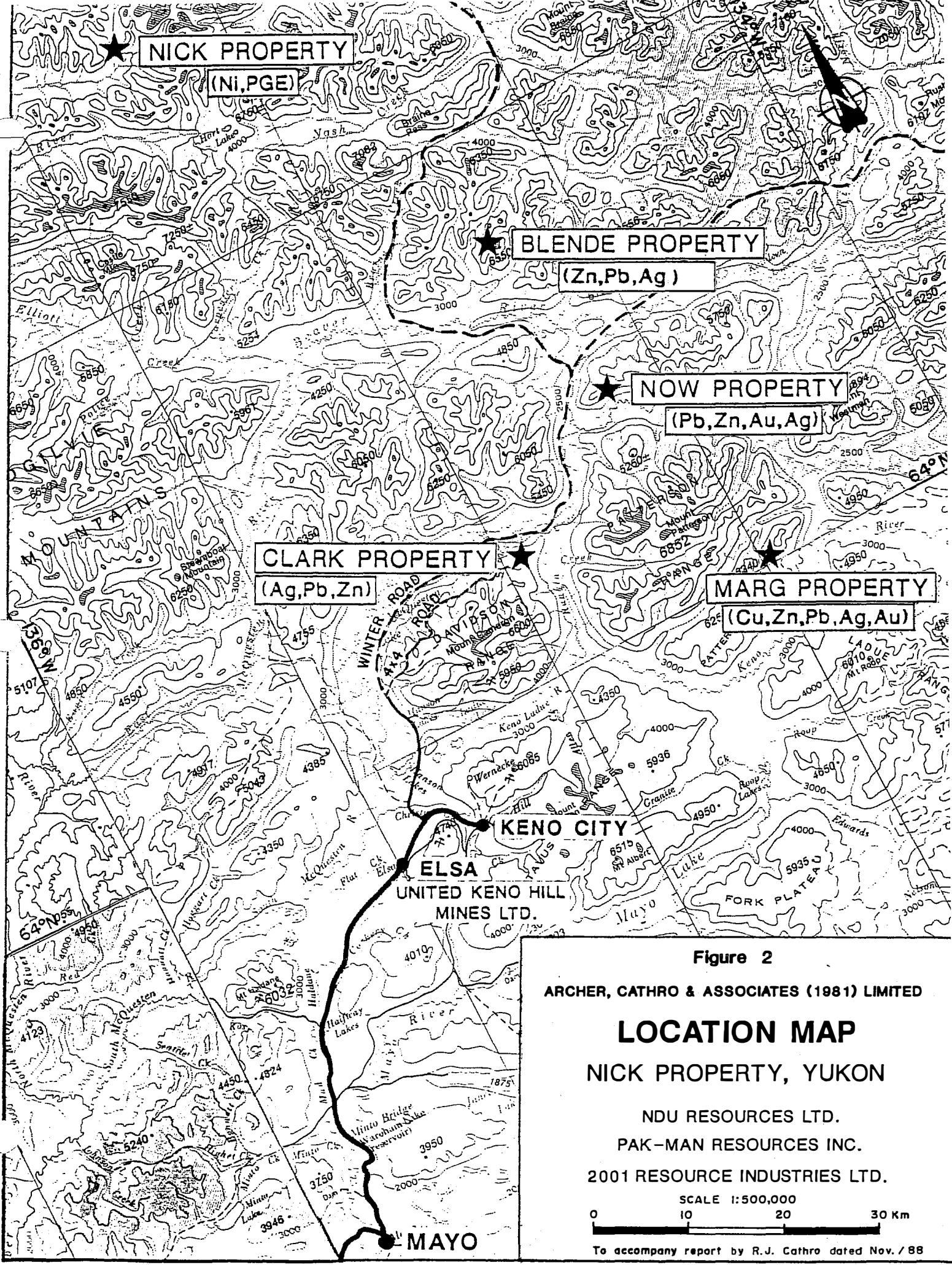
LOCATION MAP NICK PROPERTY, YUKON

NDU RESOURCES LTD.
PAK-MAN RESOURCES INC.
2001 RESOURCE INDUSTRIES LTD.

★ major deposit

SCALE 1:5,000,000





NICK PROPERTY
(Ni, PGE)

BLENDE PROPERTY
(Zn, Pb, Ag)

NOW PROPERTY
(Pb, Zn, Au, Ag)

CLARK PROPERTY
(Ag, Pb, Zn)

MARG PROPERTY
(Cu, Zn, Pb, Ag, Au)

KENO CITY

ELSA
UNITED KENO HILL
MINES LTD.

MAYO

Figure 2

ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

LOCATION MAP

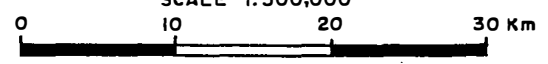
NICK PROPERTY, YUKON

NDU RESOURCES LTD.

PAK-MAN RESOURCES INC.

2001 RESOURCE INDUSTRIES LTD.

SCALE 1:500,000



To accompany report by R.J. Cathro dated Nov. / 88

LEGEND

DEVONIAN TO CARBONIFEROUS

13 Black shale, chert and minor limestone

SILURIAN (?) TO MIDDLE DEVONIAN

12 Dark grey-weathering, black, thin-bedded, platy limestone

DEVONIAN

10 Light grey limestone and dolomite

ORDOVICIAN AND SILURIAN

9 Road River Formation: Black chert and black argillite

8 Grey- and buff-weathering dolomite and limestone

PROTEROZOIC

2 Dolomite, slate, minor phyllite and quartzite

1 Argillite, slate and phyllite

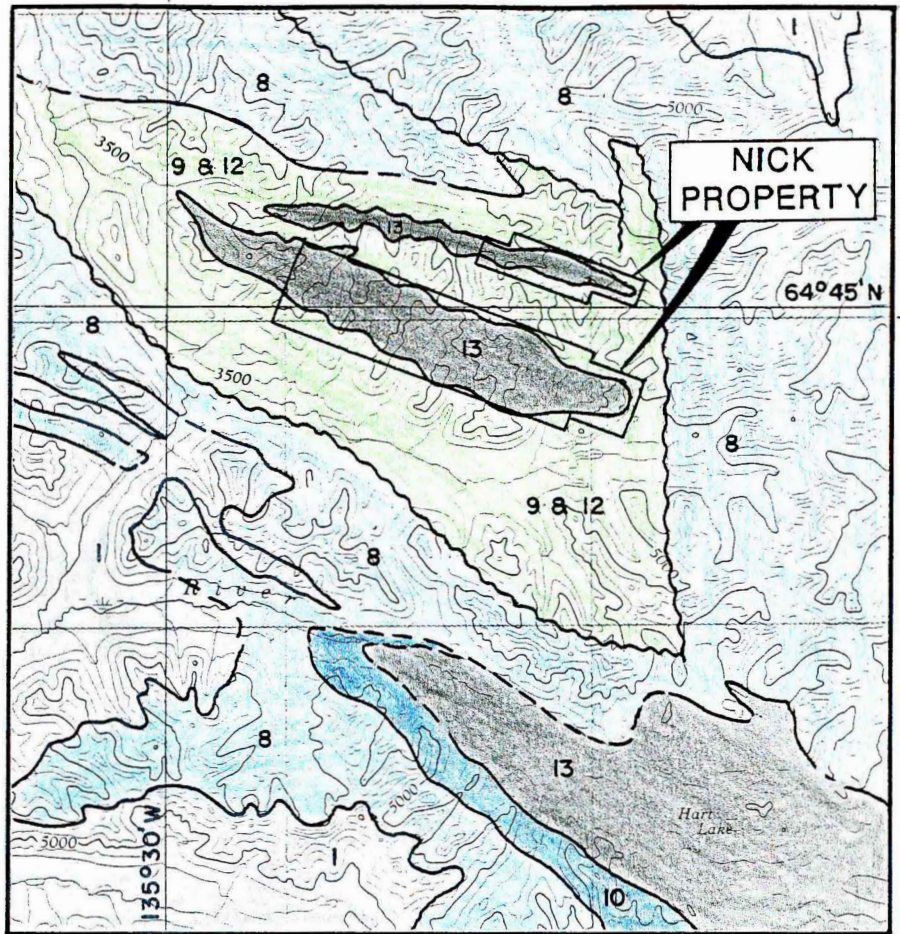


Figure 3

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REGIONAL GEOLOGY

NICK PROPERTY, YUKON

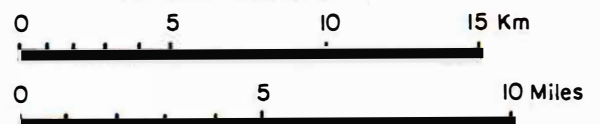
NDU RESOURCES LTD.

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2001 RESOURCE INDUSTRIES LTD.

From GSC Map I282 A and Memoir 364
by L.H. Green, 1972

SCALE 1:250,000



the abrupt contact between pre-Devonian, calcareous, non-siliceous strata and Devonian siliceous, non-calcareous, pyritic shales and cherts. The 5 to 20 m thick footwall sequence consists of a distinctive calcareous concretionary shale-siltstone sequence while a 10 to 30 m thick, cliff-forming phosphatic chert overlies the mineralized interval.

The Nick mineralization consists of a thin massive sulphide bed that has been traced by prospecting and geochemical surveys for over 100 km around the circumference of both shale inliers (Figure 4). The horizon consists of a fine-grained intergrowth of pyrite (var. melnikovite), vaesite (NiS₂) and minor sphalerite in a matrix of carbonaceous, phosphatic chert and bitumen. The sulphides form disrupted, banded concretions of spherulites and framboids, as well as disseminations and pelley aggregates. This has been interpreted as a chemical/biogenic precipitate. True thickness ranges up to 10 cm with nickel grades to 5.8%, averaging about 3.5%.

A summary of analyses performed in 1988 is given below.

<u>Sample #</u>	<u>Outcrop</u>	<u>Ni (%)</u>	<u>Pt (ppb)</u>	<u>Pd (ppb)</u>	<u>Ag (ppm)</u>	<u>Au (ppm)</u>	<u>Zn (ppm)</u>	<u>Mo (ppm)</u>	<u>Ba (ppm)</u>	<u>As (ppm)</u>
Cominco (1981) (Reassay-1988 by Cooke Synd.)	A	5.8 5.5	NA 540	NA 210	NA 10.1	NA 58	8000 9586	NA 1454	20000 90	NA 1254
S9038	A	4.6	310	150	7.8	50	138	2650	3000	2990
Cominco (1981)	B	2.9	NA	NA	NA	NA	2530	NA	2800	NA
M13918	B	3.6	280	120	9.2	86	5710	1265	40	2560
S9700*	D	4.4	5	< 2	12.6	6	772	1485	60	2260

* = strongly oxidized
NA = not assayed

The high barium assay obtained by Cominco in 1981 was not duplicated in 1988.

Trace metal analyses carried out on eight samples collected in 1988 by L. Hulbert of the GSC returned values as shown below:

<u>Metal</u>	<u>Range</u>	<u>Average</u>
Pt	200 to 800 ppb	470 ppb
Pd	Not reported	120 ppb
Ir	0.8 to 3 ppb	
Os	<60 ppb	
Rh	5 to 14 ppb	
Ru	<30 ppb	
Au	72 - 170 ppb	112 ppb
As	Not reported	4500 ppm
Se	0.25 to 0.45%	
Re	10 to 61 ppm	

Thin pyrite beds in the phosphatic chert hanging wall sequence have a completely different trace element signature than the vaesite horizons.

<u>Ni</u> (ppm)	<u>Pt</u> (ppb)	<u>Pd</u> (ppb)	<u>As</u> (ppm)	<u>Ba</u> (ppm)	<u>Co</u> (ppm)	<u>Cu</u> (ppm)	<u>Mo</u> (ppm)	<u>Pb</u> (ppm)	<u>Sulphur</u> <u>Isotopes</u> <u>δ S(o/oo)</u>
Vaesite Horizon:									
45,600	310	150	2990	10	128	65	2650	80	-11 to -14
Pyrite Layer:									
36	20	<4	10	350	3	33	34	498	+11 to +19

DISCUSSION AND CONCLUSIONS

Although the morphology and depositional setting of the Nick vaesite-bearing horizon are similar to other well known sedex deposits, the mineralogy and chemistry of the deposit are unique to North America. Little is published on the occurrence of vaesite but it is present in Lower Cambrian organic-rich shales in southern China that carry widespread thin nickeliferous massive sulphide horizons enriched with molybdenum, phosphorus and vanadium. One of the Chinese occurrences, at Songlin, has been mined since 1985. The ore occurs in a 2 m thick horizon of black shale containing 5 to 15 cm thick sulphide beds that average 2 to 4% Mo, with up to 4% Ni, 2% Zn, 0.7 ppm Au, 50 ppm Ag, 300 ppb Pt and 30 ppb Ir.

Morphology, continuity, stratigraphic setting, trace metal and sulphur isotope signatures of the Nick vaesite-bearing horizon suggest derivation from Red Sea-type, very saline, organic-rich brines ponded in anoxic bottom waters of a stratified water column within a restricted, starved-basin environment.

The closest analogy to the Nick mineralization is probably the Howards Pass deposits where approximately 500 million tonnes of material grading 5.4% Zn and 2.1% Pb have been outlined by drilling. The reserves are hosted within three deposits occurring along a 40 km long Silurian shale basin. The potentially economic thicknesses of stratiform sulphide mineralization are confined to "Third-Order Basins" or sea-floor depressions which allowed for pooling of the relatively dense, saline ore-forming fluids. The stratigraphic position of the sulphide mineralization is marked by a persistent, basin-wide, zinc-rich horizon overlain by phosphatic chert. Like the Nick horizon, the zinc-rich interval occurs at the abrupt transition between calcareous and siliceous, pyritic shales. Vent areas have not yet been discovered for the

Howards Pass deposits and no metal zoning is apparent within either the regional horizon or within the zinc-lead deposits. The mineralization is theorized to have formed from very dense, saline fluids which egressed along basin-margin faults and flowed down slope to pond in anoxic, stagnant sea-floor depressions. The deposition of sulphide minerals was apparently regulated by the supply of reduced sulphur.

Reconnaissance-scale geochemical sampling and geological mapping has outlined the position of the vaesite horizon for a distance of over 100 km around the circumference of two synclinal troughs. Further detailed stratigraphic mapping, prospecting and drilling is required to determine whether economic widths of the recessive massive sulphide horizon are present in paleo-seafloor depressions.