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# ARCHER, CATHRO



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4604) 688-2568 பாட்டு பிருத்துக்கு பிராட்டு ப மாட்டு பிருத்துக்கு பிராட்டு ப பிராட்டு பிருத்து பிராட்டு பிர

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SUMMARY REPORT

on

-1988-EXPLORATION

ARCHSPROPERTY

(BARNY, MUS, AMP and EUGERE CLAIMS)

Performed for

Pak-Man Resources Inc. Rockridge Mining Corporation and Kluane Joint Venture

> W.D. Eaton, B.A., B.Sc. November, 1988

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#### **INTRODUCTION**

The Arch Property was acquired by staking and option in 1986 by Archer, Cathro & Associates (1981) Limited on behalf of Kluane Joint Venture (Chevron Minerals Ltd. and All-North Resources Ltd.) to cover the extension of the Quill Creek Ultramafic Complex west of the Wellgreen Property. In December, 1986, the Joint Venture entered into an option agreement with Pak-Man Resources Inc. and Rockridge Mining Corporation.

Exploration in 1987 was funded by Pak-Man and Rockridge and was primarily directed toward nickel, copper and platinum group elements (PGE). It consisted of additional claim staking, grid layout, mapping, geochemical soil sampling, rock sampling, geophysical surveys and road construction. Mapping in creek cuts and old bulldozer trenches traced a mineralized ultramafic sill intermittently over a 750 m strike length and showed that semi-massive to massive sulphide lenses are developed irregularly along its footwall contact. Soil geochemistry was relatively ineffective due to a thick blanket of unmineralized talus in the main area of interest and widespread glacial terraces to the west. The geophysical surveys showed that the mineralized sill is marked by strong magnetic highs with coincident VLF-EM conductors and that similar anomalies extend 3 km further to the west under the glacial terrace. The best assay obtained in 1987 was 0.57% Cu, 2.51% Ni and 0.051 oz/ton Pt and 0.093 oz/ton Pd over 1.5 m from the Airways Showing. In addition to the Ni-Cu-PGE exploration, a few mandays were spent prospecting for gold on the Eugene claims. This work returned strongly anomalous values (greater than 9000 ppb Au) from three consecutive soil samples taken over a 75 m strike length below a quartz- carbonate alteration zone developed in pyroclastic volcanic rocks.

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The 1988 exploration program was also funded by Pak-Man and Rockridge and was performed between early June and mid-September by an Archer, Cathro crew based at the Wellgreen camp. It consisted of road construction, bulldozer trenching and three diamond drill holes totalling 173.4 m on the Ni-Cu-PGE targets, plus a few additional mandays of prospecting on the Eugene gold showing. Appendix I contains the Author's Statement of Qualifications, while Appendix II lists personnel who worked on the project.

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#### PROPERTY, LOCATION AND ACCESS

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The Arch Property is located in southwestern Yukon, 320 km northwest of Whitehorse at latitude  $60^{\circ}27'$  and longitude  $139^{\circ}25'$  on NTS claim map 115G/6 as shown on Figures 1 and 2 on the following pages. It consists of 120 claims and adjoins the west end of the Wellgreen Property. The claims are registered with the Whitehorse Mining Recorder as follows:

<u>Grant Numbers</u>	Expiry Date*
YA94968-YA94973 YA96002-YA96009	February 11, 1996 February 11, 1996
YA96863-YA96880	February 11, 1996
YA9/896-YA9/901	February 11, 1996
YA97902	February 11, 1996
YA97903	February 11, 1996
YA97904	February 11, 1996
YA97905	February 11, 1996
YA97906	February 11, 1996
YA97907	February 11, 1996
YA97908	February 11, 1996
YA97909	February 11, 1996
YA97910	February 11, 1996
YA97911	February 11, 1996
YA97912	February 11, 1996
YB08307	February 11, 1996
YA94962-YA94967	February 11, 1996
YA96010-YA96019	February 11, 1996
YA95100-YA95109	February 11, 1996
YB08097-YB08140	March 25, 1992
	Grant Numbers YA94968-YA94973 YA96002-YA96009 YA96863-YA96880 YA97896-YA97901 YA97902 YA97902 YA97903 YA97904 YA97905 YA97905 YA97906 YA97907 YA97908 YA97908 YA97909 YA97910 YA97910 YA97912 YB08307 YA94962-YA94967 YA94962-YA94967 YA95100-YA95109 YB08097-YB08140

\*Expiry dates include 1988 assessment which has been filed but not yet formally approved.

The Amp claims are held by Kluane Joint Venture under an option agreement from a prospector, Graham Davidson, while the other claims were acquired by staking. Claim locations are shown on Figure 3 in the pocket.





Direct access to the main areas of interest is provided by a system of roads, suitable for four-wheel drive vehicles, that extends 5 km northwest from the Wellgreen camp, as shown on Figure 2. The Wellgreen camp is linked to the Alaska Highway by a 14 km long gravel road that was formerly used to haul ore from the mine to the mill. Extremely heavy rainfall in June and early July resulted in severe damage to both the Wellgreen and Arch roads, which caused delays in the program but has now been repaired.

#### HISTORY AND PREVIOUS WORK

The Arch Property was staked to cover three old mineral occurrences known as Airways, Musketeer and Conwest Showings.

The Airways Showing was originally staked in 1952 as the Enger, etc. claims by a syndicate composed of Prospectors Airways Ltd., Noranda Mines Limited and Kerr Addison Gold Mines Limited, which explored with prospecting, mapping and geophysical surveys and 143 m of drilling between 1953 and 1955. The targets were restaked as Nico claims by J. Brown in 1964 and again in 1966 as the Jiffy and Tippy claims by P. Versluce and C. Gibbons, who conducted geophysical and mapping programs and trenching between 1967 and 1970. In 1972, the showing was explored under option agreement by the Nickel Syndicate (Canadian Superior Exploration Ltd., Aquitaine Co. Canada Ltd., Home Oil Limited and Getty Mines, Limited), which conducted mapping, geochemical and geophysical surveys and trenching. W. Green restaked the showing as the AMC claims in 1976 and performed some hand trenching between 1977 and 1980.

The Musketeer and Conwest Showings were originally staked in 1952 as the Musketeer claims by Teck Exploration Company Limited and the Donjek claims by Conwest Exploration Ltd. Both companies performed mapping and prospecting in 1953. Teck continued exploration in 1955 with magnetic, EM and resistivity surveys. The area was restaked as the Legacy and Sue claims in 1967-68 by P. Versluce and C. Gibbons, who carried out road building and trenching in 1968. This property was explored by the Nickel Syndicate in 1972 in conjunction with the work on the neighboring Airways Showing.

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#### GEOMORPHOLOGY

The property covers parts of two major drainages, Arch Creek, a westnorthwest flowing tributary of the Donjek River, and Swede Johnson Creek, a north-flowing tributary of the Kluane River. The two drainages are separated by a northwest-trending ridge with numerous spurs. Elevations range from 1070 m along the floors of the creeks to 1980 m on the ridge crest. Outcrop is best developed on ridge crests, north-facing slopes and actively eroding creek cuts. South-facing slopes are generally talus covered while the main creeks are flanked by glacial terraces. Soil development is poor and vegetation is limited to stunted black spruce and poplar on the floors of the larger creeks, giving way to buckbrush and slide alder on the lower slopes, and moss and lichens at higher elevations.

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#### REGIONAL GEOLOGY

The Kluane Ni-Cu-PGE belt is bounded on the northeast by the Shakwak Fault, a major terrane boundary with latest movement in a right lateral sense. The southeast boundary of the belt is formed by the sinusoidal trace of a series of interconnected faults which roughly parallels the Shakwak Fault. All known ultramafic bodies in the Kluane Range lie within this 10 to 17 km wide belt.

Geology is summarized in Table I on the following page. Oldest exposed bedrock is Pennsylvanian to Permian Skolai Group andesitic volcanic and volcaniclastic rocks (Station Creek Fm) grading upward to clastic sedimentary rocks and limestone (Hasen Creek Fm). These are overlain unconformably by Upper Triassic Nikolai Group basalt and limestone with infrequent gypsum horizons. All are intruded by Cretaceous granodiorite plutons and Oligocene porphyritic latite to trachyte dykes and small stocks.

Two types of mafic and ultramafic intrusions are present:

i) the White River, Quill Creek and Tatamagouche Creek Ultramafic Complexes are differentiated Lower Triassic sills that intrude Station Creek Fm and Hasen Creek Fm sedimentary and volcaniclastic rocks. They typically consist of strongly serpentinized dunite, peridotite and lesser marginal facies gabbro and/or clinopyroxenite. The complexes are folded and dismembered by faults, reaching maximum thicknesses of about 250 m and lengths up to 25 km.

Mineral constituents in the ultramafic rocks are olivine, clinopyroxene, orthopyroxene, biotite, plagioclase and amphibole with minor magnetite and sulphides. The gabbro phases consist of clinopyroxene

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#### TABLE OF FORMATIONS - KLUANE NI-CU-PGE BELT



differentiated ultramafic sills consisting mainly of

peridotite with lesser dunite, gabbro and clinopyroxinite



and plagioclase with minor olivine and amphibole and trace amounts of magnetite and sulphides. Cumulate textures are common in the dunite and peridotite while gabbro and clinopyroxenite phases are generally compact and massive. Most Ni-Cu-PGE occurrences in the Kluane Ranges are spatially associated with the marginal facies of the intrusions.

Chemically the mafic-ultramafic sills have high TiO2:MgO ratios, low Fe/Mg ratios and anomalously high MgO, Ni, Cr and PGE backgrounds. According to S. Campbell (1981 Ph.D. Thesis, University of British Columbia), the compositions fall very close to the fields for komatiites. Primary phlogopite biotite from the Quill Creek Complex yielded a potassium argon age determination of 224 <u>+</u> 8 Ma (Lower Triassic);

ii) dykes and small stocks of medium-grained diabasic Maple Creek Gabbro occur throughout Station Creek Fm, Hasen Creek Fm and Nikolai Group. They consist of augite and plagioclase with minor orthopyroxene, hornblende and magnetite. Field evidence supports an Upper Triassic age for the gabbros as remnants of feeder systems for the Nikolai Group basaltic flows. No known nickel or PGE mineralization is associated with the younger gabbros but they do host numerous small copper occurrences.

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#### PROPERTY GEOLOGY

The claims cover a northwest-trending sequence of Pennsylvanian to Upper Triassic sedimentary and volcanic rocks that are intruded by a series of semiconformable, mafic and ultramafic sills, as shown on Figure 4 in the pocket. These sills form the western end of the 20 km long Quill Creek Ultramafic Complex.

Most showings on the property are associated with a 100 m thick sill that is intermittently exposed in creek cuts and trenches for a 750 m strike length, as shown on Figure 5 in the pocket. Two smaller ultramafic bodies were mapped southeast of the main sill, while three more occur to the northwest. Geophysical surveys suggest that additional sills are likely present but are covered by glacial till.

The sills are predominantly composed of strongly magnetic, dark greenishblack, medium-grained, moderately to strongly serpentinized feldspathic peridotite. These rocks weather dark green with brown limonite spots and frequently exhibit white to greenish-white calcite coatings. Slickensided, scaly fractures are common and readily evident in weathered material. Olivine gabbro is generally present as a chilled phase at the northern margin of the main sill and hosts the higher grade Ni-Cu-PGE mineralization.

The main sill dips steeply to moderately southwest and appears to have intruded the conformable contact between the Station Creek and Hasen Creek Fms. On the neighboring Wellgreen Property, the ultramafic sills usually exhibit steep north or south dips and appear to be sub-vertical bodies with occasional rolls or gentle folds. Stratigraphic evidence suggests that the southwest dip on the Arch Property represents a right side up sequence with

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enclosing strata becoming younger in a downhill direction. The host rocks in the footwall of the sill are Hasen Creek Fm siliceous sediments which include argillite, mudstone and quartzite, particularly along the mineralized contact. The argillite displays alternating grey and black layers of variable thickness while the mudstone is finely layered with a light green-brown colour on fresh broken surfaces. Quartzite tends to be dark green to light brown and is often tuffaceous. Station Creek Fm rocks comprise the hanging wall of the main sill and consist of andesite and agglomerate. The andesite varies from light to dark green and is composed of a chloritized matrix with chlorite pseudomorphs after hornblende. The agglomerate is also green and is made up of subangular to subrounded chert fragments in a laminated volcanic matrix.

A second but distinctively different variety of gabbro, called the Maple Creek Gabbro, also forms sills on the property. This unit, which is composed mainly of chloritized pyroxenes and altered plagioclase laths with occasional small patches of serpentine, occurs uphill from the main sill in the central and southeast parts of the property. Fine-grained phases closely resemble volcanic rocks. The Maple Creek Gabbro has been interpreted in regional studies as a feeder to the Upper Triassic Nikolai Group volcanic rocks.

The Nikolai Group basaltic flows and related sedimentary rocks unconformably overlie the other units and are limited to a few outcrops in the southern part of the property and a thick sequence on the Eugene claims. These rocks are rich in ferromagnesian minerals and commonly exhibit amygdules that are partly filled with calcite and limonite.

A series of strong, near vertical faults trend northwesterly across the property and cut all units. They post-date the Ni-Cu-PGE mineralization but host some copper showings.

An erosional remnant of Pleistocene glacial-fluvial gravel covers a large area along the lower north side of Arch Creek at the northwest end of the claim block. The gravel is well sorted and gently dips in a downstream direction reaching maximum thicknesses of about 30 m.

#### MINERALIZATION

Prospecting and bulldozer trenching have identified eight Ni-Cu-PGE occurrences along the footwall contact of the main sill and one at the hanging wall contact. These occurrences are described below while their locations are shown on Figure 5.

The Airways Showing is exposed in shallow hand trenches and an old buildozer trench. It consists of a 10 m long, up to 1.5 m wide lens of massive pyrrhotite with chalcopyrite associated with a narrow gabbro chill margin along the footwall of the sill. Massive sulphide talus can be traced intermittently up a vegetated slope to the northwest but to the southeast possible extensions are completely obscured by unmineralized talus. A chip sample taken across the lens in 1987 assayed 0.57% Cu, 2.51% Ni, 0.051 oz/ton Pt, 0.093 oz/ton Pd and 0.002 oz/ton Au over 1.5 m while a specimen collected by F.A. Campbell in 1955, which was assayed for PGE by Falconbridge, returned 0.045 oz/ton Pt, 0.044 oz/ton Pd and 0.012 oz/ton Rh. A 3 m wide, malachite stained fracture zone is developed in footwall quartzite adjacent to the lens and a sample from it assayed 0.44% Cu and 1.20% Ni but only 0.001 oz/ton Pt, 0.004 oz/ton Pd and 0.001 opt Au. Sheared peridotite forms the hanging wall of the zone and is weakly mineralized with disseminated sulphides for 20 to 30 m widths. A chip sample of this material taken in 1987 yielded 0.25% Cu, 0.36% Ni, 0.012 oz/ton Pt, 0.016 oz/ton Pd and 0.002 oz/ton Au over 5 m while a 1988 diamond drill hole (A88-02) returned similar values over a wider interval, as described in the Diamond Drilling section.

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The <u>NF Showing</u> was discovered in 1988 in a bulldozer trench 50 m southeast of the Airways Showing on the other side of a deeply eroded creek. It consists of thick crusts of dark brown limonite, with rare sulphide patches, on fractures in highly weathered ultramafic rock along the footwall of the sill. A sample of limonitic material returned 0.73% Cu, 0.51% Ni, 0.073 oz/ton Pt and 0.076 oz/ton Pd over 1.5 m.

The <u>NFR Showing</u> lies 170 m east of the NF Showing near the east end of the main sill. Mineralization is limited to a few specimens of heavily disseminated gabbro float collected from the ribs of a bulldozer trench. A sample of the best mineralization assayed 2.98% Cu and 2.22% Ni but only 0.002 oz/ton Pt and 0.060 oz/ton Pd. No mineralization was intersected on the floor of the trench.

The <u>KK and Lofty Showings</u> are exposed in a road cut and adjacent bulldozer trench 140 m northwest of the Airways Showing. Both consist of strongly limonitic gabbro forming a chilled margin along the base of the sill. A chip sample across the KK Showing yielded 0.58% Cu, 0.50% Ni and 0.018 oz/ton Pt and 0.036 oz/ton Pd over 4 m, while a specimen from the Lofty returned 0.80% Cu, 0.60% Ni, 0.045 oz/ton Pt and 0.067 oz/ton Pd.

The <u>FW Showing</u> lies 170 m west-northwest of the KK Showing and is comprised of two limonite-rich gabbro outcrops developed where a small creek has eroded through the footwall contact of the sill. A chip sample from the east side of the creek assayed 0.80% Cu, 0.47% Ni, 0.027 oz/ton Pt and 0.041 oz/ton Pd over 2 m, while one from the west side of the creek returned 0.23% Cu, 0.34% Ni, 0.163 oz/ton Pt and 0.061 oz/ton Pd over 1 m.

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The <u>Yoshi Showing</u> consists of weakly malachite stained, limonite boxwork fragments collected from a road cut 100 m west of the FW Showing. The mineralized float appears to have been derived from an unexposed zone along the footwall contact. A sample containing several fragments yielded 1.20% Cu, 0.13% Ni, 0.063 oz/ton Pt and 0.100 oz/ton Pt.

The <u>Condie\_Showing</u> is located in a creek cut 130 m west of the Yoshi Showing. It includes several mineralized exposures developed in narrow gabbro chill margins at both the footwall and hanging wall contacts of the sill. Chip samples from the Upper Condie Showing at the footwall contact assayed up to 0.76% Cu, 0.60% Ni, 0.027 oz/ton Pt and 0.105 oz/ton Pd over 1 m, while those from the Lower Condie Showing along the hanging wall contact 100 m to the south returned up to 0.38% Cu, 0.97% Ni, 0.048 oz/ton Pt and 0.035 oz/ton Pd.

The Condie Showing is the most westerly of the showings on the main sill but it is also the last place that the contacts are exposed. Magnetic and VLF response suggests that the sill extends at least 500 m farther west.

The weighted average grade of the chip samples taken from showings along the footwall contact of the sill is 0.66% Cu, 0.81% Ni, 0.034 oz/ton Pt and 0.059 oz/ton Pd over 2.0 m. In most cases, weakly mineralized gabbro and peridotite adjacent to the showings were not sampled; however, two samples were taken near the Upper Condie and Airways Showings and averaged 0.24% Cu, 0.32% Ni, 0.14 oz/ton Pd and 0.021 oz/ton Pt over 5 m. Petrographic studies and metallurgical testing of the Wellgreen ores have shown that most of the metals in the mafic and ultramafic rocks occur as sulphide minerals and, therefore, are potentially recoverable.

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Work elsewhere on the property has located small copper occurrences in a number of areas, plus a gold showing on the Eugene claims. The Musketeer and Conwest Showings, which date from 1952, reportedly contain nickel and copper but resampling of the Musketeer in 1987 returned only 0.02% Cu, 0.13% Ni, trace Pt, 0.001 oz/ton Pd and trace Au. Exploration in 1988 west of the Musketeer Showing discovered up to 1 m thick, weakly malachite stained, massive pyrite lenses in argillite adjacent to ultramafic sills; however, assays returned low values for all metals.

The Eugene gold occurrence is associated with up to 3 m thick quartz-carbonate alteration zones developed in Nikolai Group volcanic rocks. The zones tend to be sub-horizontal or vertical and typically consist of a poorly developed stockwork of white quartz veinlets surrounded by tan carbonate altered volcanics. Fine grains of pyrite, chalcopyrite and arsenopyrite are rare. Although soils taken directly below the zones returned strongly anomalous gold values (greater than 10,000 ppb) and individual rock specimens assayed up to 5000 ppb Au, seven chip samples taken from different parts of the zones returned disappointing values (40 to 420 ppb Au). Representative specimens of other rock types in the talus all returned near background values. Arsenic was the only metal other than gold that was present in anomalous levels, returned 30 to 470 ppb Au from the chip samples.

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#### DIAMOND DRILLING

The drilling was done by E. Caron Diamond Drilling Limited of Whitehorse using a unitized, wireline equipped Longyear 38 drill. Bulldozer support for moves, road construction and drill site preparation was provided by Caterpillar D7 or D8 bulldozers on contract to the Wellgreen Project or a Caterpillar D6 bulldozer owned by a local placer miner, depending upon equipment availability and the work required. All holes were drilled using HQ equipment with mud and water supply was not a problem. Recoveries averaged 72% but varied greatly from interval to interval.

The drill program was conducted between August 12 and 18 and consisted of three holes totalling 173.4 m. The first hole was drilled on the Amp claims and tested a strong magnetic high and coincident VLF conductor which occur in an area blanketed by glacial till. The other two holes explored beneath massive sulphide lenses developed along the footwall contact of the main ultramafic sill. Figure 4 shows the location of the drill holes, while Figures 6, 7 and 8 on the following pages are cross sections illustrating drill results. Assay certificates are included as Appendix III and drill logs are in Appendix IV.

All holes intersected weak to moderately mineralized ultramafic sills but failed to intersect any massive sulphide lenses. Hole A88-1 cut a 25 m wide strongly serpentinized sill that averaged 0.03% Cu, 0.22% Ni, 0.004 oz/ton Pt and 0.004 oz/ton Pd across its entire width. Although these assays are subeconomic, they are typical of values in peridotites adjacent to the ore bodies at Wellgreen. Hole A88-2, which tested downdip and slightly along strike from the Airways Showing intersected peridotite and gabbro with weakly disseminated

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Quartzite

Intermediate Volcanics

-0.75, L44, 0.019, 0.046 %Cu, %Ni, optPt, optPd



To accompany report dated Nov./88

sulphides. It averaged 0.15% Cu, 0.29% Ni, 0.012 oz/ton Pt and 0.013 oz/ton Pd across its entire 41 m length, including 0.28% Cu, 0.35% Ni, 0.020 oz/ton Pt and 0.023 oz/ton Pd across the last 10.8 m before the footwall contact. These values are of direct interest, especially considering the sill exhibits a moderate dip which is subparallel to the slope of the hill thus resulting in a low stripping ratio. Hole A88-3 cut sheared peridotite with a 4.7 m wide gabbroic chilled margin along the footwall contact. Recovery was poor in peridotite and the part that was sampled returned only weakly anomalous values; however, a 2.6 m wide band of the gabbro containing heavily disseminated sulphides returned a highly significant 0.75% Cu, 1.44% Ni, 0.019 oz/ton Pt and 0.046 oz/ton Pd.

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#### SUMMARY AND RECOMMENDATIONS

The Arch Property covers the west end of the 20 km long Quill Creek Ultramafic Complex, which is emerging as a major Ni-Cu-PGE camp. The complex consists of a series of en echelon sills hosting numerous large, pyrrhotitepentlandite-chalcopyrite occurrences, including those comprising the Wellgreen Deposit. Feasibility studies are currently underway at Wellgreen to determine whether or not sufficient reserves have been outlined to justify an open pit mine, mill and plant to melt concentrates to produce a matte.

Geological mapping and geophysical surveys on the Arch Property have outlined several ultramafic sills and anomalies apparently caused by buried sills. Bulldozer trenching and diamond drilling have shown that the largest and best exposed sill contains widespread disseminated mineralization with heavier disseminations and massive sulphide lenses developed in gabbroic chilled margins. The gross metal values of some of the widely disseminated mineralization (notably the weakly mineralized peridotite and gabbro in Hole A88-2) is about \$50 U.S./ton at current prices. Material of this grade might be economically mined by open pit methods assuming enough tons are present, the metals are primarily occurring in sulphide minerals that are easily separated from the rock, and the ore could be custom milled at Wellgreen. Fortunately the sill exhibits a moderate southerly dip subparallel to the slope of the hill and, therefore, stripping ratios would be minimized, as shown on Figure 9 on the following page. Heavily disseminated and massive sulphide mineralization could be mined with the lower grade mineralization from an open pit mine or selectively mined as an underground operation, once again assuming that enough tons are present to justify the development costs and a mill is operating

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at Wellgreen. The geometry of the mineralization is relatively favourable for underground mining as the higher grade ore consistently follows the footwall contact, a fairly short (approximately 250 m) crosscut provides 200 to 300 m of backs, the vein is dipping steeply enough that the broken rock in stopes should move by gravity alone and much of the development can be done in the competent footwall quartzite unit, as illustrated on Figure 9. The biggest potential problems with underground mining would probably be caving and dilution from the weakly mineralized hanging wall peridotites. Considering that the sill is mineralized in most exposures over a 750 m strike length and is open in both direction, tonnage potential is excellent.

The next stage of exploration should consist of systematic diamond drilling along the main sill to establish its overall grade and the density of high grade lenses along the contacts, coupled with a few "wild cat" holes to test additional geophysical targets on the glacial terrane west of the main sill. Metallurgical tests should be performed once reserves are outlined to determine probable recoveries from different ore types. The cost of the program is estimated at \$832,000, as calculated on the following page.

> Respectfully submitted, ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

W.D. Eaton, B.A., B.Sc.

/mc

#### ARCH JOINT VENTURE PROPOSED BUDGET NOVEMBER, 1988

Diamond Drilling	
300 m of diamond drilling with HQ & NQ	\$450.000
	<i>ų</i> 100,000
Bulldozer	
at \$125/hr, fuel and operator included	62,500
Labour	
500 hrs of senior supervision, geologist for 150 days, 2 fieldmen for 100 days each, cook for 100 days	105,000
<u>Field Expenses</u> - 1000 mandays at \$65/day	65,000
Travel and Transport	32,500
Metallurgical Testing	25,000
Assays	
300 samples geochemically analyzed for Cu. Ni. Pt. Pd at \$20/sample: 100 samples assaved	
for Cu, Ni, Pt, Pd at \$50/sample	11,000
Drafting and Printing	15,000
Orthophotos and Surveying	20,000
Assessment	5,000
Management	41,000
	\$832,000

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## APPENDIX I

# AUTHOR'S STATEMENT OF QUALIFICATIONS

#### STATEMENT OF QUALIFICATIONS

I, W. Douglas Eaton, geologist, with business addresses in Whitehorse, Yukon Territory and Vancouver, British Columbia, and residential address in Burnaby, British Columbia, do hereby declare:

- 1. I graduated from the University of British Columbia in 1980 with a B.Sc.
- From 1971 to present, I have been actively engaged in mineral exploration in British Columbia and Yukon Territory and on June 1, 1981, I became a partner in Archer, Cathro & Associates (1981) Limited.
- 3. I have personally participated in or supervised the field work reported herein and have interpreted all data resulting from this work.

WRX

W. Douglas Eaton, B.A., B.Sc.

## APPENDIX II

LIST OF PERSONNEL

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# LIST OF PERSONNEL

NAME	POSITION
Rob Carne	Geologist
Doug Eaton	Geologist
Betsy Fletcher	Geologist
Mary MacLellan	Geologist
Kevin Stewart	Fieldman
Kim Stewart	Fieldperson

APPENDIX III

ASSAY CERTIFICATES

P Bondar-Clegg & Company Ltd. 150 Pemberton Ave. North Vançouver, B.C. V7P 2R5 '604) 985-0681 Telex 04-352667

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Geochemical Lab Report

REPORT: V88-04	166.0			1			PROJECT: ARCH	PAGE 1
SAMPLE	ELEMENT	Pt	Pd		Ni	Au 3Ng		
NUMBER	UNITS	PPB	PP8	PPM	PPM	PP8		
D2 C11001			40	2000	250			
R2 S11002		190	- 10 90	12500	380			
R2 S11003		<15	4	86	95			
R2 S11004		2100	740	4000	2400			
R2 S11005		30	10	240	42	62		
R2 S11006	. <u> </u>	80	25	310	130	76		
R2 S11007		1550	2300	8000	6000			
R2 S11008		80	2065	>20000	>20000			
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Booter-Grap, & Company Ltd. 130 Pemberion Ave In-rith Vancouver 18 C. Cunada V7P 2R* Phone: (418) 9844681 Tetex 06 (*2667				BONE		CLEC	<u>G</u>	Ce of A	rtificate Analysis
RI PORT: V88-0	4166.6					PROJFCT	: ARCH	PAGF	1
SAMPLE NUMBER	ELEMENT	Cu PCT	Nî PCT						
R7 S11008		2.98	2.22						
1								····	
			•••••						¢
				-					
					<b>`</b>		Ka)	Tul	<b></b>

Registered Assayer. Province of British Col.

Bontor-Ling & Company Lid 1 Vi Pemberion Ave Narth Vancuver, Bor 4 anda VTP 285 Phinie (604) 985-4541 Teles, 04-31/26





	REPORT: V88-	N4115.4			1			I	PROJECT: ARCH	PAGE 1
	SAMPLE NUMBER	ELFMENT UNITS	Au OPT	Ag Opt	Pt OPT	Pd OPT	Cu PCT	Ni PCT		
	R2 H43488		N.NN2	0.25						
	R2 H43489				<b>0.035</b> ∠0.002		n.67	1.74		
	R2 H43491				0.021	0.060	2.84	0.02 N.24		
	R2 H43492				N.N63	N.100	1.20	0.13		
	R2 H43493				n.n95	n.38N	۵.33	0.42		······································
	R2 H43494				N.N68	N.312	N.52	0.47		
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Registered Assayer, Province of British Columa



	REPORT: V88-	05351.4						PROJECT: ARCH	PAGE 1
	SAMPLE NUMBER	ELEMENT UNITS	Pt OPT	Pd Opt	Cu PCT	Ni PC1			
_	R2 S11033		0.008	0.021	0.90	0.34	······		
	R2 S11034		0.021	0.041	0.47	0.55			

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136 Industrui Road Wheetone, Yukon Termory YIA 2VI Phone (403) 667-6523 Tetes 036-8-460



## Geochemical Lab Report

REPORT: VE8-	95400.0			PROJECT: ARCH	PAGE 1		
Sample Minder	ELEMENT UNITS	PT PPB	PD 253	CU FPN	ni Pph	:	
R2 511009		<15	4	18	27	<u></u>	
R2 511010		<15	4	730	36		
R2 51:011		15	+	5400	29		
R1 511012		15	5	650	102		

Bundar Crag & Commu 1 VI Princetion Ave North Visitionare B.C 7 analis VTP 28* Prover Wish 1994 (166) Texes 194-35276*	w Les.					DAR-	CLEGG	Certificat of Analys
REPORT: V88-044	97.4		·····				PROJECT: ARCH	PAGF 1
Cample Number	ELEMENT UNITS	Pt OPT	Pd OPT	Cu PCT	NI PCT			
R2 S11018		0.928	9.211	0.41	0.39			
								4
	<u></u>		······					
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					·· ··	,		
							-	
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<u> </u>					, <u>,,,,,,,,</u> ,,,,,,,,,,,,,,,,,,,,,,,	<u></u>	Q.	The



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BOX 4127 WHITEHORSE, Y.T. YIA 389 Project ARCII Conmé n t s

Page Tot. Fages 1 . 20-AUG-88 Date Invoice # .1-8820632 P O. # NONE

#### **CERTIFICATE OF ANALYSIS** A8820632

SAMPLE DESCRIPTION	PREP CODE	Аи ррь FA+AA				1					
H 53319 H 53320 H 53321 H 53322 H 53323	205 205 205 205	<pre>&lt; 5 175 5000 75 15</pre>			     						
H 53324 H 53325 H 53326 H 53327 H 53327	205            205            205            205            205            205	< 5 < 5 < 5 35	-				,	     		-	-
H 53331 H 53335	205						1 1 1				
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	l i										
		1									
						-				/ 1/	
				5			CER	TIFICATION	_ free	<u>k/ (12</u>	m

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## Geochemical Lab Report

FEFURI: V86-0/	230.0						PROJ	ECT: ARCH	PAGE 1
Sample Namber	ELEXEN F UNITS	PT 898	FD P?B	65¥ CJ	NI FPM				
- D2 \$14995 D2 \$14996 D2 \$14996 D2 \$14997 D2 \$14998 D2 \$14999		- 150 120 150 120 120 120		<sup>27</sup> 357 273 447 394 184	2150 2115 2085 2500 1674				
02 S1.000	· · · · · · · · · · · · · · · · · · ·		160 C		2230				
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136 Industrial Road Whitehome, Yukon Terntory Y1A 2V1 Phone, 4033 667-6523 Tetez, 036-8-460



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## Geochemical Lab Report

NE-051: V88-0	05752.0							PROJECT: AXCH		7AGE 1
Sample Number	ELEMENT UNITS	PT P78	РD РРУ	- CJ PP <del>N</del>	NI PPN	······································				
D2 514934 D2 514935 D2 514936 D2 514936 D2 514937 D2 514938		89 360 320 160 240	95 320 350 190 2+0	486 951 1196 632 633	1963 2450 2700 2162 2350					
02 514939 02 514940 02=514941 _02=514941 _02 514942 02 514943		250 450 450 500 800	330 470 - 460 - 570 - 1970	1121 1541 1465 2070 3420	3100 3250 3290 3150 3650					
12 S1+944	- -	720	629	3480	4100	· · ·				
	•				-					
	-	••••••••••••••••••••••••••••••••••••••	· · · ·		• • • •	- * *			· · · ·	
			<u>.</u>							
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Geochemical Lab Report

REPORT: V88-06728.0	· · · · · · · · · · · · · · · · · · ·	• •		,	PROJECT: ARCH	PAGE 1
SAAPLE ELEMENT NUMBER UNITS	PT PD PPB PPB	CU N PPN PPI	1 1	-	- <u> </u>	
R2 511043 B2 511422 C7DZ 511423 B2 511425	<15     2       110     1s0       220     320       160     290	267 26 498 1600 793 1800 1266 1104	5 <u> </u> 7 3 0 0	•		
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				ی مرابع ترکی ایک ترکی ایک مرابع		
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		a Out with	1. K. R. R. R.	The About			1773		C EVEN SHS
			44			MAG	and Farmer F		Tree Trees side
A 2	VI.	annan hannan,			-15.2			متنغة استنا ( د.	( Same ) Same 202

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# Geochemical Lab Report

REPORT: V89-007	/28.4			]	PROJE	T: ARCH	PAGE 1
Sanple NUMBER	ELEMENT UNITS O	pt pd Pt Opt	CU PCT	NI PCT			
D2 511424	0.0	19 0.046	0.75	- 1.44		~~~	
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	······································		۰ . ۲	-			
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SOX 4127 WHITEHORSE, Y T. YIA 389 Project ARCH/FIRIENE Comments Page N | Tot. P | Date .29-SEP-88 Invoice # I-8824198 P O # NONE

# CERTIFICATE OF ANALYSIS A8824198

SAMPLE DESCRIPTION	PRE COL	ep >e	Au ppb AFS	Pd ppb AFS	Рт рръ AFS						
S-11056 S-11057 S-11058 S-11059 S-11060	205 205 205 205 205 205		1 2 0 4 2 0 1 2 0 4 0 1 4 0	-+ 8 16 16 12	<pre>&lt; 5 &lt;&lt; 5 &lt;&lt; 5 &lt;&lt; 5 &lt;&lt; 5 </pre>						
S-11061 S-11062	205 205		280 52	18 12	< 5 < 5	 -			-		
				,							
											0
							CKR	INCATION :	$\mathcal{D}$ .	( -0	X





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WHITEHORSE, Y T YIA 389 Project : ARCH/FUGENE Comments.

BOX 4127

Page N Tot F Date 29-SEP-88 Invoice # 1-8824199 PO # NONE

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#### **CERTIFICATE OF ANALYSIS** A8824199

SAMPLE DESCRIPTION	PREP CODE	> 2	A I %	F	Ag opin	As ppm	Ba ppm	Be ppm	Bı ppin	Ca %	Cd ppm	Co ppin	Cr ppm	Cu ppm	Fe %	Ga ppn	Hg ppm	K %	La ppm	Mg %	Miı pçan	Mo ppm
S-11036 S-11037 S-11038 S-11038 S-11039 S-11060	299 2 299 2 299 2 299 2 299 2 299 2	]8 ]8 ]8 ]8 ]8 ]8	0.27 0.23 0 53 1.85 1.16	< 0 < 0 < 0 < 0 < 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	30 470 125 150 80	20 40 40 60 60	< 0.5 < 0 5 < 0 5 < 0 5 < 0 5 < 0.5	4 < 2 8 < 2 < 2	1 97 2 17 5 86 6 01 5 53	< 0 5 1 0 < 0 5 < 0 5 < 0 5	6 14 28 27 21	240 203 67 106 130	35 85 91 87 28	2 09 2.57 6.95 7 37 5 76	< 10 < 10 10 10	< 1 < 1 < 1 < 1	0 05 0 06 0 07 0 13 0 15	10 10 < 10 < 10 < 10	0 74 0 72 2.54 2.74 2 16	412 419 1130 1250 950	~~~~~
S-11061 S-11062	299 2 299 2	18	1.02 1 75	< 0	. 2	150	70 60	< 0.5 < 0 5	10 < 2	5 69 6 67	< 0 \$ < 0 \$	28 29	79 125	117 144	6.35 6 29	10 20	1	0 23 0 16	< 10 < 10	2 49 2 82	1235 1440	< 1 < 1
	Í										Ł									3	0	
<u>Land, interaction</u>		-													CERT	пысалю	)N	Æ	<i>3. (</i>	<u>a-</u> g	:l:	



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BOX 4127 WHITEHORSE, Y T YIA 3S9 Project . ARCH/FUGENE Comments

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Page N (-B Tot F .1 Date .29-SEP-88 Invoice #.1-8824199 P O # NONE

# CERTIFICATE OF ANALYSIS A8824199

SAMPLE DESCRIPTION	PR CO	ep De	Na 96	Nı ppm	P ppn	Рь ppm	Sb ppm	Sc ppm	Sr ppm	Тı %	Ti ppin	U angg	V ppm	W ppni	Zn ppn	
S-11056 S-11057 S-11058 S-11058 S-11059 S-11060	299 299 299 299 299 299	238 238 238 238 238 238 238	0 03 0 02 0 08 0 03 0.04	11 20 41 34 27	1 10 290 510 420 480	30 32 10 10 4	< s < s < s < s < s	5 8 25 27 20	46 < 47 < 121 < 123 < 114 <	<pre>     0 01     0 01     0 01     0 01     0 01     0 01     0 01     0 01 </pre>	< 10 < 10 < 10 < 10 < 10 < 10	< 10 < 10 < 10 < 10 < 10 < 10	18 15 52 140 59	<	34 51 111 88 67	
S-11061 S-11062	299	238	0.04 0.03	40 45	1080 660	< 2 8	< 5	20	176 < 119 <		< 10 < 10	< 10 < 10	61 116		80 77	
		L												CERT	IFICATIO	N: B. Cardi

APPENDIX IV DRILL LOGS

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A	RCHE	R, C	ATHR(	D & ASSOCIATES (1981) LIMIT	ED PROJECT ARCH				PRO	PEF	TY	A	RCH	H	IOLE I	NO. A	88 - 01	Pa	age I	of I
	Eleva Coorc Dip Azimu	tion linate 50° ith O	8 20°	Drill Contracto Hole started Target: MAG./	r E.CARON II/08/88 completed I4/0 VLF	Log 8/88	ged	i p)	/ Bet	tsy	Fletc	her		Tota Core	l dept size	h 85. HQ	65 m			
Depth	%	Visual	Struct	Lithology	Alteration		Vein	and	Altera	tion	Miner	alog	y Sample	Assay			Азбаз	y Result	8	
(m)	Recov	Log				!	PØ CP						Number	Interval	Cu(%)	Ni(%)	Pt(oz/t)	Pd(oz/t)		
		· · · · · · · · · · · · · · · · · · ·		Argelite ¢ inter-bedded tuff aphanitic w/microphenocrysta		r L														
- 20														1 						
	ر 	······································																		
- 30																				
- 40			<u></u>	LMST	-	· Þ	%					_	3 14995	4.90	0.04	0.22	0-004	0.005		
			ا د شمه ا د مم	Perd. very strongly sheared & serpentinized -		-					,		14996	4.10	0.03	0.21	0.003	0.004		
50			لم م م م م م	mod millerite on fractures	c								14997	5.54	0.04	0.21	0.004	0.005		
			ام م ام م	58.64-64.31 m cut by felsite dykes									14998	4.00	0.04	0.25	0.004	0.005		
- 60 -			م م م م										15000	1.50	0.02	0.17	0.004	0.005		
			- 4	Argl. W/Icm to Im tuff beda									13/40/	1.36	0.00	0.52	0.00+	01002		
- 70				Limestone very strongly recrystallized w/arg. interbeds	· · ·															
- 60				Argi.	· · ·												1			
- 90																				

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Depth %	Visual	Struct	Lithology	Alteration	Ve	n and Alte	ration Mine	eralogy	Sample	Assay		<u> </u>	Азба	y Resulti	8
(m) Rec	ov Log	Slidet			PØ	P PN ML A		$\left[ \right]$	Number	Interval	Cu(%)	NI(%)	Pt(oz/t)	Pd(oz/t)	
			Feldepathic Peridotite						s 14934	5,18	0.05	0.20	0.002	0.002	
- 10			cumulate olivine with 15-25% interstitial sauserifized plag.	strong serpentinization					4935	4.57	0.10	0.25	0.009	0.009	
·			1-2% PØ Dise 5-10% Dise \$ stringers		1- 2%				14936	4 57	0.12	0.27	0.009	0.010	
- 20									14938	4.57	0.06	0.24	0.005	0.007	
									14939	4.57	0.11	0.31	0.008	0.010	
-80	0000		Paridotite wmulate olivine with 5-10% int. PL \$	i - 9	2-				14940	4.57	0.16	0.33	0.013	0.014	
	0 0 0 0 9 0 0 0 0 0 0 0		2-4% diss PØ 2-5% diss MT	strong serpentinization	4%				14941	2.81	0 15	0.32	0.013	0.013	
-40			Clinopyroxenite Typical spotty CLPx Tex. Cx vepl. by uralife	strong serpentinization					14942	4.81	0.21	0.32	0.015	0.017	
	0.000		2-5% dies PØ 2-5% diss MT						14944	- 1. 38	0.35	0.41	0.021	0.018	
- 50		BD.80° to CA.	Gabbro Pine grained Cu PL + CX Tuff (tuffaceous qzit)		F10%	1%									
	.v.v.v.	^	Aphanitic W/P.g - microphenos		+				-			1			
- 60															
													1	1	

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Elev Coo Dip Azir	vation rdinate - 50° nuth 020	°8 24+ ⊃°	Hole started Target: Geophysics	r E.CARO 16/08/88 3 Anomely \$ K	N completed K showing	18/C	Logged b )8/88	y E	Setsy	Fletche	r		Tota Core	l dept size	h <sup>34</sup> HQ	.Im			
Depth %	Visual	Stevet			Altorotion		Vein an	d Alter	ation	Mineral	logy	Sample	Assay	<u></u>		Assa	y Result	8	
(m) Rec	V LOG	SHUCI					PØ CP					Number	Interval	Cu(%)	NI(%)	Pt(oz/t)	Pd(oz/t)		
			Peridotite es - olivine \$ 5-10% CX \$ minor PL \$ PH	strong sorp	entinization	ا ج ا			-			5 11422	4.39	0.05	0.16	0.003	0.005		
- 10	°°°		7'	· ·		5	R					423	5.97	0.08	0.18	0.006	0.009		
	°°°		15.	· · · .									NO CORE						
			chilled gabbro or f g Tuff ? ** h!. w/pg g sp blebs & stangers		3%	1251	12% 3%		1		Ē	11424	2.61	0.75	1.44	0.019	0.046		
- 20			Tuff (tuffsceous quit) aphanitic tuff with microphenoa bedded at 30-50° to CA Parts brecciated										5CH						

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ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

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PROJECT ARCH PROPERTY ARCH

Page I of I HOLE NO. A 88-03



# MAP SYMBOLS





▲ Cu(%), Ni(%), Pt(oz/ton), Pd(oz/ton)

Intersection (m)

# JTR Nikolai Group b green and purple amygdaloidal basalts Import of the state of the sta

LEGEND

# LITHOLOGIES

139°36

# Permian \_

LP Hasen Creek Formation argillite (black to gray) siltstone / siliceous argillite (olive green) quartzite (brown to gray) limestone (white to gray) tq tuffs / tuffaceous quartzites (dark green to lt. brown)

# <u>Pennsylvanian</u>

TP Station Creek Formation

 agglomerate / volcanic breccia (green)

 t

 crystal / lapilli tuffs (green)

 andesitic flows or subvolcanic intrusions

# Figure 5 ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

# **DETAILED GEOLOGY**

# ARCH PROPERTY

PAK-MAN RESOURCES INC. ROCKRIDGE MINING CORPORATION KLUANE JOINT VENTURE



To accompany report dated Nov./88



	LEGEND
•	1988 Diamond drill hole
<b>*</b> 0.80, 0.60, 0.045, 0.067	Rock specimen assay Cu(%), Ni(%), Pt(opt), Pd(opt)
0.80, 0.60, 0.045, 0.067	Chip sample assay Cu(%), Ni(%), Pt(opt), Pd(opt)
	length (m)
640, 29, -, 4	Rock and soil sample values Cu, Ni in ppm, Pt, Pt in ppb
57000	Total magnetic field (nanoteslas)
20	VLF-EM Response; Fraser filtered (%)
	Ultramafic Sills
	Fault
	Geological contact-defined, approximate
	1987 grid survey
<u> </u>	Bulldozer trench
	Road-2 wheel drive, 4 wheel drive
	Boundary of 1:2500 map sheets (1987 Report)
<u> </u>	Glacial-fluvial gravel terrace

	INTRUSIVE ROCKS
ITRUD	Lower Triassic differentiated komatilitic sills consisting mainly of perido- tite (IRp) with lesser dunite (IRd) and anorthositic gabbro
<b>ħ</b> N <b>v</b>	<u>LAYERED ROCKS</u> <u>Upper Triassic</u> <u>Nikolai Group</u> – dark green and maroon amygdaloidal basalt, volcanic breccia and conglomerate; minor thin-bedded limestone, chert and argillite unconformity
РНи	Lower Permian <u>Hasen Creek Formation</u> – siliceous argillite, sandstone, amygdaloidal pillow basalt, limestone and conglomerate
νSν	<u>Pennsylvanian and (?) Permion</u> <u>Station Creek Formation</u> – tuff, volcanic breccia, siliceous argillite, andesite and basalt flows Geology compiled from mapping by Hudson – Yukon, S. Campbell,
	Geology compiled from mapping by Hudson – Yukon, S. Campbell, G.S.C. and Kluane J.V.



To accompany report dated Nov./88