ARCHER, CATHRO
& ASSOCIATES LIMITED
CONSULTING GEOLOGICAL ENGINEERS

VANCOUVER, B.C. (604) 688-2568   BOX 4127, WHITEHORSE, Y.T. Y1A 3S9 (403) 667-4415

1016 - 510 WEST HASTINGS STREET
VANCOUVER, B.C. V6B 1L8

GEOCHEMICAL AND GEOLOGICAL REPORT

NAT JOINT VENTURE

LILYPAD 1-32 CLAIMS

AND NEWT 1-6 CLAIMS

NTS 115I/5

Latitude 62°27' North   Longitude 137°55' West

Work done 5 July 80 to 23 August 80

E.P. Onasick, B.A.Sc., M.Sc., P.Eng.

A.R. Archer, B.A.Sc., P.Eng.

January 1981

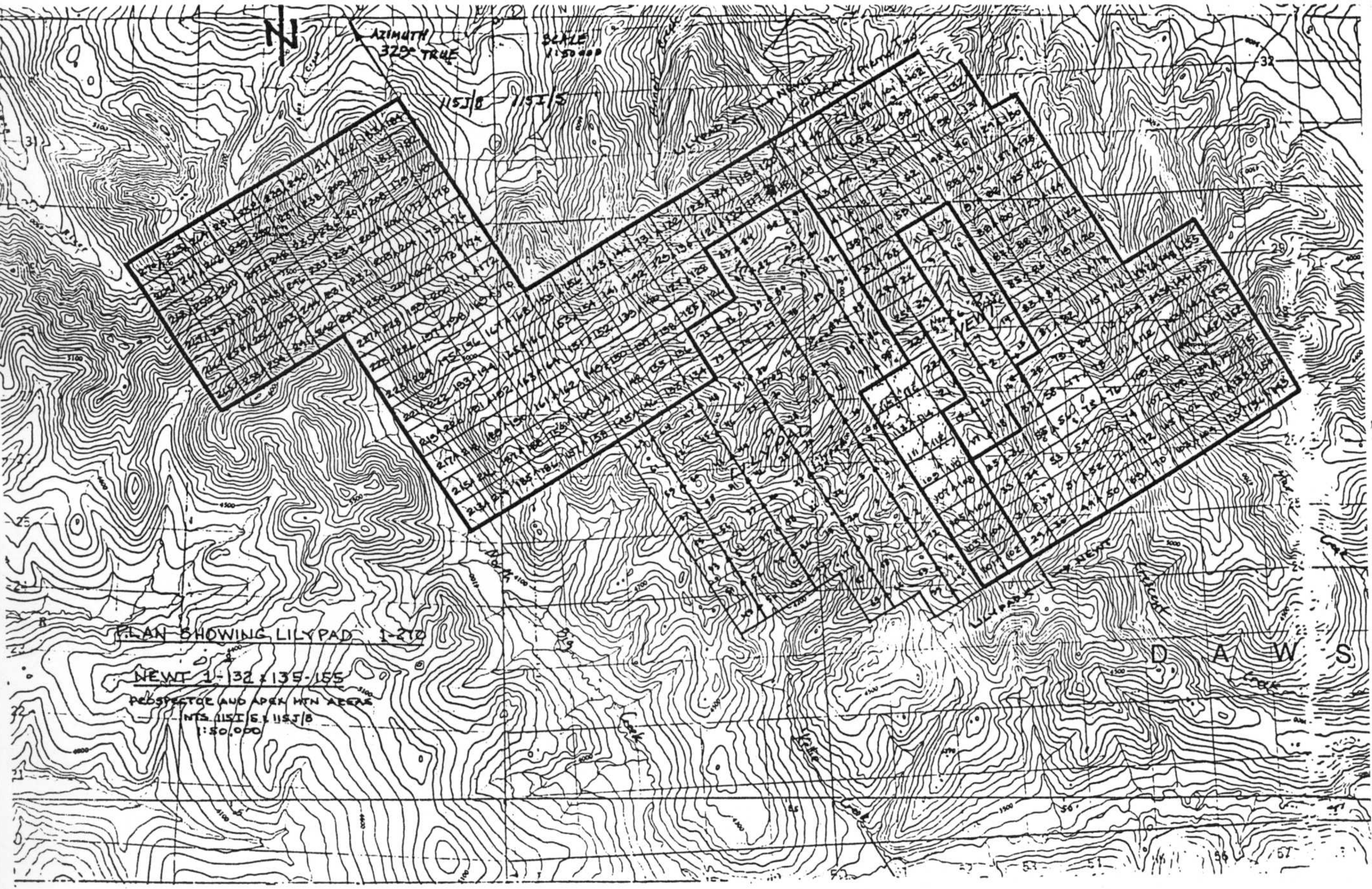
090741

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representation work in the amount of $ 10,364.00

Resident Geologist or
Resident Mining Engineer

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.

B.R. BAXTER
Supervising Mining Recorder
Commissioner of Yukon Territory



N
AZIMUTH
329° TRUE
SCALE
1:50000
115J/8
115I/5
PLAN SHOWING LILYPAD 1-210
NEWT 1-132 & 135-155
PROSPECTOR AND APEX MTN AREAS
NTS 115I/5 & 115J/8
1:50,000
D A W S

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INTRODUCTION

Samples collected in 1969 by Archer, Cathro that were previously analyzed for copper, molybdenum and lead outlined a cluster of moderate lead anomalies in the vicinity of Apex Mountain. About 100 samples splits from this cluster were reanalyzed in 1979 for gold and silver, and a coincident silver anomaly was outlined and staked (Lilypad 1 to 16 claims). After NAT Joint Venture was formed (Chevron Canada Limited and Armco Mineral Exploration Ltd., equal partners), these claims were vended to NAT at cost and additional 1969 sample splits were reanalyzed for gold, silver, lead and arsenic. The 1979 reanalyses were also updated to include arsenic.

The NAT crew, comprised of geological engineer E. Onasick and geological assistants N. Ball, B. Grainger, J. Robertson and A. Tolvanen, under the supervision of A.R. Archer, first visited the property on 5 to 7 July, 1980 and returned to follow up encouraging geochemical assays in early August. Twenty-two claims were added at that time.

Prospecting the anomalous areas in mid-August located evidence of mineralized vein zones and additional claims were staked during the period 17 to 23 August. Detailed prospecting of the Lilypad 1-32 and Newt 1-6 claims and surrounding area, concurrent with the staking program located 27 vein exposures from which mineralized specimens were collected for assay.

These assay results, which were unexpectedly favourable, were not available until after the end of the field season. A special management meeting was held in Vancouver on 12 September to review the results, which led to the decision to expand the property, linking the Lilypad and Newt groups.

Geochemistry and geology of the Hayes Creek region are illustrated as Figures N7A, N7B and N7C respectively. A detailed geochemical map of the Lilypad/Newt claims is shown as Figures N8A and N8B. Report preparation was carried out in Vancouver during the period September to December, 1980.

PROPERTIES, LOCATION AND ACCESS

The Lilypad and adjoining Newt properties consist of 423 contiguous mineral claims forming a sub-rectangular east-trending block approximately 15 km long and 8 km wide. Claims are recorded in the Whitehorse Mining District as follows:

Claim Name	Record Numbers	Expiry Date
Lilypad 1-16	YA25267-282	14 Feb 83
Lilypad 17-32	YA51163-178	14 Aug 81
Lilypad 33-100	YA51500-567	16 Sep 81
Lilypad 101-270	YA51601-770	24 Sep 81
Newt 1-6	YA51157-162	14 Aug 81
Newt 7-20	YA51486-499	16 Sep 81
Newt 21-132	YA51771-882	24 Sep 81
Newt 135-155*	YA51883-903	24 Sep 81

• Note - no Newt 133-134 claims.

The Lilypad-Newt claims are centered at latitude 62°27' north and longitude 137°55' west, straddling NTS claim sheets 115J/8 and 115I/5, about 93 km northwest of Carmacks. Access in 1980 was by Hughes 500C helicopter (supplied by Trans North Turbo Air Ltd. of Whitehorse), from a camp 68 km southeast on Mt. Nansen road, or from Casino, 60 km northwest.

PREVIOUS WORK

Seven mineral occurrences described in Archer, Cathro's Northern Cordillera Mineral Inventory (NCMI) lie within the Hayes Creek area of interest and are plotted on Figure N7C. The main emphasis of previous exploration has been for porphyry-type copper-molybdenum and copper-lead-zinc targets during the period 1969-70, and to a lesser extent for gold in 1975. A brief summary of each occurrence follows:

NCMI (5): Chalcopyrite in small quartz veins cutting Carmacks volcanics was explored by geochemistry in 1969 by Dawson Range Joint Venture and staked in 1970 by London Pride Silver ML.

NCMI (31): Minor amounts of sphalerite, galena, chalcopyrite, arsenopyrite, tetrahedrite, and molybdenite in weak quartz veining occur in strongly altered, weakly leached, pyritic quartz monzonite porphyry cutting unaltered monzonite. The property was staked as the Tad claims in 1969 by Indian Mtn. ML, Lion Nickel M of Can L, Prado EL and Gui-Por Uranium ML, and explored by geochemistry, geophysics, trenching, road construction and drilling (18 holes). Claims were adjoined to the southeast in 1970 by Norcan ML and to the east in 1973 by T. Worbetts. The best mineralization from drilling was 27.4 g/MT (0.8 oz/ton) Ag and 1.0 g/MT (0.03 oz/ton) Au over 7 m.

NCMI (32): Bornite and chalcopyrite mineralization in quartz stringers and disseminated in a large stock of hornblende quartz monzonite intruding Yukon Group metasediments was staked as Kook, Pat and Apex claims in 1969 by Montana ML and optioned in 1970 to Phelps Dodge, which explored by mapping, sampling and magnetometer survey. The claims were transferred to Chatham Res L in 1973.

NCMI (34): Minor chalcopyrite and galena in quartz veins cutting Mt. Nansen volcanics, and galena and sphalerite in a contact zone produced lead and silver silt anomalies that were staked as Frog claims in 1969 by International Mines Services L Syndicate and as PDY claims in 1969 by Phelps Dodge. The Wing claims were also staked in 1969 south of the Frog group by Sabina ML but were not explored. Most of the ground underlying these claims is now covered by NAT's Lilypad/Newt claims.

NCMI (36): Copper mineralization with minor silver and zinc generated a soil anomaly coincident with an aeromagnetic anomaly that was explored by sampling and trenching in 1970 to 1973 by Starbird ML. The Pro claims were staked immediately north in 1970 by Can. Occidental Pet L, which prospected and soil sampled in 1971

NCMI (100): A 150 m shear zone containing breccia fragments within a siliceous matrix, as well as closely-spaced quartz veinlets, cuts quartz monzonite and Yukon Group metasediments and has generated weak arsenic and antimony soil anomalies. One sample of sheared schistose granite returned 5.5 g/MT (0.16 oz/ton) Au, although most samples assayed less than 0.3 g/MT (0.01 oz/ton) Au. The shear was staked in 1975 by DC Syndicate, which performed geochemical sampling, trenching and mapping.

NCMI (101): A silicified zone cutting granitic rocks and overlain by Carmacks volcanics has generated weak arsenic and antimony soil anomalies with gold values up to 2 g/MT (0.03 oz/ton) Au, and was staked, mapped and sampled by DC Syndicate in 1975.

PHYSIOGRAPHY AND GLACIATION

The Hayes Creek area lies within the unglaciated Dawson Range, a subunit of the Klondike Plateau that is characterized by narrow, dendritic valleys separated by long, smooth-topped ridges with uniform elevations. The ridges are remnants of an old, uplifted erosion surface that rises in places to form relatively smooth-sloped mountains with up to 850 m relief near Apex Mountain. Outcrop in the

Dawson Range is generally scarce, but can usually be mapped by examining frost broken scree or felsenmeer which is common on the steeper hill slopes.

Valley bottoms are almost always obscured by thick alluvium, and are lightly treed with black spruce and dwarf birch. The subrecent volcanic ash layer is thin in this area, usually less than 10 cm, and does not hinder sampling. Although local annual precipitation is probably less than 50 cm and snow thickness is correspondingly low, the claims are totally snow free only for approximately three months of the year.

GEOLOGY AND MINERALIZATION

Regional Geology

The Hayes Creek area lies within the Yukon Crystalline tectonic belt, which can be divided into three major lithologies: a Paleozoic and late Proterozoic assemblage of metamorphic rocks, a set of varied Mesozoic and Tertiary plutonic rocks, and a sequence of Tertiary volcanic strata.

The metamorphic rocks (PPsn) are undifferentiated gneisses, quartzites and schists known as the Yukon Group. The oldest member, the Pelly gneiss, is probably of late Windermere age and is comprised of granodiorite gneiss and biotite schist, with local marble. This is overlain by graphitic quartzite and slate of the Nasina quartzite member, and by a Carboniferous (?) muscovite-quartz schist and amphibolite member referred to as the Klondike schist. The Yukon Group was probably derived from quartz-rich sediment and metamorphosed in the late Triassic.

These older rocks were invaded by four groups of plutonic rocks, including: late Triassic quartz diorite (Ꞧ gdm); Jurassic pink quartz monzonite and porphyritic quartz monzonite (Ꞧ qm, MJ qmp); Cretaceous to Tertiary Coffee Creek quartz monzonite to granite (Tg) and Nisling Range granodiorite and syenite (MJ gd, MJ y); and Eocene alaskite (Tgal), the imprint of the Coast Plutonic belt on the Yukon

Crystalline Terrane.

The Mt. Nansen Group (TMN) is an assemblage of subaerial acid tuffs, and is the extrusive phase of the Nisling alaskite. Coexisting with these explosive volcanics is a subaerial basalt, the Carmacks volcanics (eTcv). Recent (1980) work at the University of B.C. has shown these two volcanic units to be coeval (about 70 $\pm$ 5 Ma), representing a calc-alkaline to alkaline compositional gradient from volcanic front to craton in a late Cretaceous volcanic arc system. The Mt. Nansen volcanics have been correlated to the Skukum Group in Whitehorse map area.

Feeder zones to the volcanics are sometimes exposed, and are characterized by quartz-feldspar porphyry (Tqfp), a very fine grained acid to basic rock with feldspar and variable amounts of quartz phenocrysts, typically 20 to 30%.

A linear topographical and aeromagnetic feature known as the Big Creek Lineament (also referred to as Big Creek Fault) can be traced parallel to the northwest regional trend from Carmacks through Big Creek and Hayes Creek to the Yukon River. It is related to most of the mineralized porphyries in this region of Yukon, possibly directly as a channel of mineralizing fluids or indirectly as a zone of crustal weakness that allowed porphyry systems (and volcanic centers) to develop along it. Notable porphyry deposits in close spatial proximity to the lineament include: Mt. Freegold (LaForma), Yukon Revenue, Klazan, Cash, Tad, Mt. Cockfield and Casino. All of these porphyry systems contain associated gold and silver values as well as peripheral gold-quartz and gold-silver-carbonate veining. In some cases (Mt. Freegold), the precious-metal veining is the most economic feature of the porphyry system.

Local Geology

All of the units discussed above also lie within the Hayes Creek area, illustrated at 1:25,000 scale as Figure N7C. The geological literature is inconsistent about this area, and the geological map published by the GSC is locally inaccurate. The following paragraphs discuss some problems in map correlation and interpretation of lithologies.

Both the Mt. Nansen and Carmacks volcanics are now considered coeval, as discussed above, varying mostly in alkalinity and silica content. In the field, however, these two units sometimes appear significantly different. Mt. Nansen (T_{MN}) type is aphanitic to fine grained in texture, competent with a blocky talus, vitreous to sugary in lustre on broken surfaces, and monochromatic, usually grey to black with green tints. The Carmacks volcanic (eTcv) type differs in having a "rich, brown" weathering, a less competent, rubbly talus (often with carbonate on fractures), tuffaceous and brecciated phases, and various colorations ranging from maroon to pale green and grey, as well as dark grey (like T_{MN}). Since these differences may affect mineralization, both names have been preserved and the units are shown separately on Figure N7C. However, since both grade into each other, the phase boundaries are interpretive, and areas mapped as one unit may contain some of the other.

On the Lilypad claims and in the surrounding area, the eTcv volcanics vary as follows:

(1) fresh, moderately fractured, brick red- to grey-weathering, massive to slightly porphyritic, unaltered, very fine grained red and grey-green, slightly amygdaloidal basalt;

(2) varicoloured (pink, green, white, yellow) volcanic tuff breccia (clasts typically 1 cm) with chlorite, quartz and calcite;

(3) sheared, very fine grained, pale green, propylitically altered (chlorite, epidote, carbonate) flow basalts (stretched amygdules).

The tuff breccia appears to be the most prevalent, but the massive variety is common in some areas. Mineralization (discussed in a following section) may be more closely associated with the tuff breccia.

Only one occurrence of the plutonic phase of these volcanics (Tgal) was recognized as alaskite, whereas the porphyritic phase (Tqfp) was found in several isolated locations in a northwesterly trend across the map area. In some cases, the porphyry is characterized by quartz phenocrysts, typically 1 mm in size, in an aphanitic to very fine grained, greenish-grey to brownish or mauve, quartzo-feldspathic matrix; in others feldspar is the principal phenocryst constituent. At some locations, the Tqfp is brecciated (clasts to 2 cm). Two bodies of Tqfp (?), one at the headwaters of Frog Creek and the other on the ridge between the headwaters of Frog Creek and Peter Creek, were mentioned in a 1970 Phelps Dodge report but were not verified by the NAT crew.

A northwesterly-trending band of granitic rocks (potassium feldspar) is prominent in the central part of the map area, including granite (Tg), granodiorite to quartz monzonite (KTqm) and syenite (KTy), and their porphyritic phases (KTqmp and KTyp). The Tg granite is the only type that is distinct: it is a typically equigranular, coarse grained, biotite granite and occurs in one location south of Apex Creek. The other units are differentiated on the basis of silica content, types and proportions of feldspars and texture. No regional trends were evident in these features, and gradations are common with the divisions between phases on Figure N7C being somewhat arbitrary.

Silica content varies from less than 5% (syenite, KTy and KTyp) to about 35% (quartz monzonite or granodiorite, KTqm and KTqmp). In some places, the quartz content changes rather abruptly as the rock grades from granodiorite to syenite (or monzonite, which has not been differentiated) as can be seen near the mouth of Frog Creek. Hornblende and biotite comprise the mafic minerals.

Texture of plutonic rock varies from fine to medium grained and rarely coarse grained, with porphyritic varieties (potassium feldspar phenocrysts up to 1 1/2 cm) common. Colour is typically grey, buff or pinkish, often rusty after minor pyrite.

Unusual contact metamorphic effects have been observed at volcanic-intrusive contacts in several locations, shown as hatched areas on Figure N7C. The Tertiary volcanics (T_{MN} and eTcv) were formerly believed to be younger than the intrusive rocks, which are mapped as Mesozoic (M gd and M qmp), but thermal metamorphic effects (banded hornfels, tourmaline formation associated with minor pink aplitic dyking) in the volcanics suggest that at least in some areas the reverse is true. Accordingly, the granitic rocks have been updated to include Tertiary rocks in the NAT mapping (KTqmp instead of M qmp, etc.). D.J. Tempelman-Kluit of DIAND has indicated that there are indeed intrusions in this area that are coeval with the Mt. Nansen volcanics, probably representing sub-volcanic (feeder) dykes of syenitic composition, that are closely related to Tgal. He suggests an age of youngest Cretaceous to Tertiary (65 Ma) for this package.

Most of the volcanic rocks are altered to some degree, typically a weak to strong propylitic alteration characterized by chlorite, epidote and carbonate constituents, especially in rocks classified as Carmacks volcanics (eTcv). The chlorite and epidote are always found within the rock groundmass, whereas the carbonate may also be manifested as calcite veining or coatings on fractures. Alteration in the intrusive rocks is also present, although not as pervasively as in the volcanics. The mafic minerals, such as hornblende, are commonly weakly chloritized, but are sometimes completely altered. Plagioclase has altered to montmorillonite in some cases (argillic alteration). Weak quartz veining as stringers is rarely visible. As mentioned above, in the vicinity of the intrusive-volcanic contact there is locally abundant tourmaline, occurring as stellate clusters and in massive form associated with cockade quartz in aplitic dyking, and some fractures show bleached alteration envelopes in the country rock to a thickness of one or two centimetres. This phyllic grade was the highest degree of alteration observed on the Lilypad property.

Mineralization

Almost all of the rocks in the Hayes Creek area contain pyrite. Rusty weathering is prevalent in Yukon Group quartzites, Carmacks volcanics and in isolated patches within syenite and quartz monzonite. Pyrite typically occurs as disseminated cubes less than 1 mm in size, locally reaching 3% to 4% of the rock, but usually less than 1%. Both magnetite and hematite are present in, or associated with, volcanics and some of the crystalline rocks, Magnetite is microscopic and can only be detected as rock magnetism, whereas the hematite is common, particularly in the Carmacks volcanics, where it occurs as coarse disseminations, coating fractures, in amygdule fillings, and cementing breccia in association with quartz veins and other mineralization.

Random boulders and talus fragments of quartz were noted during initial reconnaissance of the Lilypad claims and in the vicinity of Apex Mountain, but the vein source of this float was not recognized until later in the field season. The veins are only obvious on ridges where they are seen as linear depressions containing patches of scattered oxidized and leached vein material interspersed with sheared and faulted country rocks. Two predominant sets (000° to 005° and 020° to 045°) of steeply-dipping vein linears can be seen on airphotos. There is a suggestion that the most easterly striking variety, which is the strongest of the two, may be part of a radial set of fractures centered at a point some ten km northeast of the claims.

These lineaments weather recessively and are often obscured by debris from adjacent wall rocks, but characteristically form shallow gullies with strike lengths up to a kilometer and widths ranging from a few metres to more than 100 m. Fault gouge is sometimes present, as well as some alteration minerals (kaolinite), suggesting substantial movement along the lineations in at least some instances. At the Newt showing (#24 on Figure N7C), heavy gouge is prevalent and a large horse of chloritic volcanics can be seen caught up in the fault. This fault, which is of the radial variety, can be traced for at least six km in length on airphotos and contains mineralization in two locations some five km apart. The veins are most readily recognized where they cut volcanic rocks. They can be traced as weak lineations into the intrusive rocks, which also show recessive weathering but generally lack evidence of vein material.

Vein material typically consists of pale brown, rusty or black, strongly pitted and vuggy, drusy, cockade and ribbon quartz with associate goethite, jarosite, scorodite, malachite and/or anglesite rimming and/or filling the pits. Galena is occasionally present and was found in massive pieces of hand-specimen size at showing #24. One such specimen returned an assay of 69.3% Pb and 3361 g/MT (98 oz/ton) Ag. Unoxidized pyrite, arsenopyrite, and chalcopyrite are rarely seen. The pitting appears to represent leached mineralization that is most likely a boxwork after carbonate (siderite?) containing pyrite, galena and sulphosalts. Specular hematite is found in some, but not all, veins and black manganese stain is characteristic on most fractures and weathered surfaces. Disseminated and massive tourmaline occur in several veins, especially in the Apex Mountain area. No actual gold or silver mineralization was recognized, although silver-rich tetrahedrite is suspected due to the silver-copper-lead-arsenic association.

Silver-to-lead ratios (oz/ton/%) vary from 0.1:1 to 394:1 on the property. Ratios for the four rocks returning the highest silver assays are 1.4, 10.5, 7.6

MAP LOCN	Pb %	Ag		Au		Ag:Pb oz/ton/%	Ag:Au	Remarks
		g/MT	oz/ton	g/MT	oz/ton			
1	0.11 0.48	42.53 648.27	1.24 18.90	3.70 6.04	0.108 0.176	11.3 39.4	11.5 107.4	5m wide quartz veining in a small saddle; limonite-cemented fault breccia with minor malachite, hematite, galena, scorodite, boxwork limonite; strong leaching
2	6.16	78.20	2.28	2.26	0.066	0.4	34.5	quartz veins (005°); goethite boxwork with anglesite, minor galena, trace malachite; quartz pitted
3	0.82	48.71	1.42	5.97	0.174	1.7	8.2	*100 m wide structure*; cockade quartz veins (005°); galena, anglesite; composite sample across structure
4	0.06 1.03	10.98 79.58	0.32 2.32	0.34 1.10	0.010 0.032	5.3 2.3	32.0 72.5	recessive fault (040°), 3 m wide; gossanous, gougy(?) soil; Mn stain (rock) boxwork limonite in soil; one 2 cm pebble with massive galena, chalcopyrite
5	3.50	100.16	2.92	1.37	0.040	0.8	73.0	extension of Zone 1? 20 m long, ½ mile wide quartz vein; up to 50% goethite-filled pits; galena; anglesite
6	6.34	396.51	11.56	1.17	0.034	1.8	340.0	100 m wide, recessive(!), abundant quartz with minor galena, anglesite; Mn stain; goethite pits
7	3.20	91.24	2.66	7.41	0.216	0.8	12.3	2 m wide fault (030°); minor galena with quartz
8	0.68	17.84	0.52	0.69	0.020	0.8	26.0	50 m wide, recessive(!) saddle; minor quartz veining (005°); trace galena, pyrite
9	0.16	8.23	0.24	0.62	0.018	1.5	13.3	15 m wide fault (030°); galena, pyrite, limonite boxwork in quartz veining
10	3.14 >0.40 >0.40	199.28 51.45 172.87	5.81 1.50 5.04	1.78 0.21 0.82	0.052 0.006 0.024	1.8 N/A N/A	111.7 242.7 210.8	30 m wide, well-developed *vein; minor galena*, malachite, tetrahedrite(?); abundant limonite in quartz ribbon quartz vein; locally drusy; minor pits, jarosite grey quartz vein with 20% goethite-filled fractures
11	0.24	9.60	0.28	0.34	0.010	1.2	28.0	top of hill, not recessive; pieces of quartz vein in talus; 5 mm blebs chalcopyrite; limonite; barite
12	>0.40 2.74	1007.05 987.15	29.36 28.78	0.92 1.58	0.027 0.046	N/A 10.5	1094.6 625.7	copper-stained soil with galena 20 m wide fault (020°); Mn stain; limonitic boxwork with galena; minor malachite, azurite stain
13	5.76	98.78	2.88	4.94	0.144	0.5	20.0	recessive(!) structure; traces of galena in hairline quartz veins
14	0.19	10.98	0.32	1.23	0.036	1.7	8.9	small recessive structure; specular hematite in quartz veins
15	0.12	34.99	1.02	0.10	0.003	8.5	340.0	10 m wide quartz vein (040°); limonitic; minor pyrite and tourmaline; exposed 30 m on strike
16	0.06 0.35	6.17 200.66	0.18 *5.85*	0.17 *21.81*	0.005 *0.636*	3.0 16.7	36.0 9.2	zone up to 200 m wide; *fault gouge*; Mn stain; bleached volcanic; tourmaline veining; minor pyrite, arsenopyrite; extensive pitting
17	0.04	32.24	0.94	0.10	0.003	23.5	313.3	75 m wide zone, gouge; 2 to 6 cm fragments specular hematite; limonite; no Mn stain
18	0.36 6.43 0.13 0.23	187.62 30.18 87.81 209.23	5.47 0.88 2.56 6.10	1.85 0.62 0.22 1.24	0.054 0.018 0.007 0.036	15.2 0.1 19.7 26.5	101.3 48.9 390.5 169.4	a series of quartz veins (005°) and limonite stockworks; minor malachite, pyrite, scorodite, tetrahedrite(?), more abundant specular hematite quartz geode with epidote, specular hematite; minor bornite, malachite limonitic; specular hematite; in volcanic breccia
19	0.12 0.48	27.44 225.00	0.80 6.56	0.69 1.44	0.020 0.420	6.6 13.6	40.0 156.2	quartz veining (030°) possibly related to Zone 6; pyrite, specular hematite, minor malachite; limonitic boxwork
20	0.22 0.39	39.10 20.58	1.14 0.60	0.05 0.21	0.001 0.006	5.2 1.5	868.9 98.0	Apex Mt; 2 m float train (040°); 50 pieces quartz with tourmaline, carbonate, *pyrite, limonite*; pitted soil; *residual near float train*
21	0.36	16.12	0.47	0.18	0.005	1.3	94.0	Apex Saddle, soil in syenite talus
22	0.01	89.18	2.60	Trace	Trace	393.9	N/A	fine grained quartz geode, local veining; malachite, calcite
23	>0.40	145.43	4.24	0.43	0.013	N/A	338.2	soil from 8 m wide zone (060°) of bleached gouge; massive chalcedony
24	2.74 69.30	395.48 3361.40	11.53 98.00	1.92 1.10	0.056 0.032	4.2 1.4	205.9 3062.5	20 m wide fault (170°) with gouge and volcanic remnants; main Newt Showing sample of almost pure galena; also minor malachite, pyrite, tetrahedrite, anglesite, limonite in soil pit
25	0.08 3.20	20.58 828.69	0.60 24.16	0.96 0.48	0.028 0.014	7.5 7.6	21.4 1725.7	quartz veining, limited exposure; galena, anglesite, chalcopyrite, malachite, limonite in soil fragment with galena and anglesite
26	N/A	1.00	0.003	4.80	0.140	N/A	0.02	*Prospector Mt; talus with* rusty, specular hematite, quartz veining
27	N/A	56.94	1.66	0.24	0.007	N/A	242.3	Prospector Mt; off claims; limonitic, siliceous talus; Tqfp(?)

Table HC-1

Vein Showings, Lilypad and Newt Claims

and 39.4 to 1. Silver-to-gold ratios are more erratic: ratios for three of the above four specimens, for example, are about 10:1, whereas the fourth is over 100:1. This variation is characteristic of the property.

A summary of twenty-seven showings illustrated on Figure N7C is shown as Table HC-1 on the preceeding page. It should be noted that these veins were discovered with only six mandays of exploration, that some of the showings may be from the same vein system, and that the assayed specimens were selected for their mineralization and represent the best grab samples that were found at that locality.

GEOCHEMISTRY

Results of geochemistry in the Hayes Creek area are shown in the following illustrations:

Figure N7A	Regional Au, As
Figure N7B	Regional Ag, Pb
Figure N8A	Detail Au, As (Lilypad 1-100, Newt 1-20)
Figure N8B	Detail Ag, Pb

Samples within the detail area are not all shown on the regional maps. Samples were collected in kraft bags at 400 m spacing and at creeks and outcrops, dried at the end of the day and shipped to Chemex Labs in North Vancouver, where they were screened to -35 mesh, pulverized and re-screened to -80 mesh. About 170 previously-collected samples and 910 samples collected during NAT's 1980 field season have been analyzed for gold, silver, arsenic and lead. Selected samples were further analyzed for antimony, and 76 silt and rock samples were also analyzed for mercury. Analysis techniques used were: "combo" (fire assay followed by Atomic Absorption or Neutron Activation Analysis) for gold; nitric-perchloric extraction followed by AA for silver and lead; arsenic-hydride vapour technique for arsenic; acid-leach followed by iodide complexing and AA for antimony; and nitric-hydrochloric acid digestion followed by flameless AA for mercury.

Anomalous results of the geochemical analyses are shown as Table HC-2 (see following page). The table gives the number of anomalies and "strongly" anomalous samples for each element and sample type, including mineralized samples.

The Lilypad 1 to 16 claims were staked on anomalous lead response in silts from a 1969 regional program. Lead and arsenic in silts are the best regional indicators of mineralization in this area, using 150 ppm lead and 40 ppm arsenic as threshold. Gold and silver response is regionally erratic and the best geochemical response in these elements appears to be restricted to mineralized faults (see Table HC-1). The higher rock-sample assays are due to the fact that most represent selected mineralized specimens. Many of the anomalous soil samples were also collected in zones of observed mineralized float.

The highest assays for the four main elements are included in Table HC-2; five of these values are from showings (described in Table HC-1).

The highest mercury assay from a rock specimen was 2100 ppb Hg (showing #24); mercury assays from silts returned only background values, reaching a maximum of 80 ppb Hg. Two antimony rock assays exceeded 1000 ppm Sb (showings #24, #25) and the highest regional silt assay returned a moderately anomalous 3.0 ppm Sb. Background is less than 1.0 ppm Sb in the Dawson Range.

Although geochemical sampling is not uniformly distributed in the Hayes Creek area, and anomalous patterns are partly a result of the location of sample sites, certain clusters of anomalous geochemistry can be interpreted. The most coherent clustering is shown by lead, which outlines three areas. The largest includes most of the western two-thirds of the Lilypad/Newt claims. Two smaller clusters of anomalous lead values occur just east of the Nit claims and at the headwaters of the Klotassin River, the latter coincident with anomalies in the other elements. Silver response forms smaller and more localized clusters within the area outlined by lead, notably at Apex Mt., the area within 2 km of Frog Creek, and two small

TABLE HC-2

ANOMALOUS GEOCHEMISTRY IN HAYES CREEK AREA

		Rock	Soil	Silt	Total	%[3]
Au	⩾60 ppb[1]	39	9	4	52	4.8
	⩾500	21[2]	0	0	21	1.9
	max.[4]	21.8g/MT[5]	305 ppb	136 ppb	-	-
As	⩾ 40 ppm	36	50	21	107	9.9
	⩾100	25	24	6	54	5.0
	>500 (max.)	6	7	0	13	1.2
Ag	⩾ 2 ppm	39	21	2	62	5.7
	>10	33	4	0	37	3.4
	max.	3361g/MT[6]	1007g/MT[7]	7.4 ppm	-	-
Pb	⩾150 ppm	46	38	14	99	9.2
	>500	36	9	1	46	4.3
	max.	69.3%	>0.4%	1150 ppm	-	-
Number of samples		318	541	221	1080	-

Notes:

(1) Anomalous levels based on typical geochemical response in the Dawson Range.

(2) The greater proportion of "strong" anomalies in rocks, compared to soils or silts, reflects selection of mineralized specimens.

(3) Anomalous samples expressed as a percentage of total number collected for each sample type.

(4) The maximum value returned from 1980 sampling.

(5) 0.636 oz/ton

(6) 98.0 oz/ton

(7) 29.4 oz/ton

clusters in the center and east of the Nit claims. Arsenic anomalies cluster into five main areas: the region around the Nit claims, within 3 km of Apex Mt. in a northeasterly trend, the north half of Anneli Creek, the east side of North Big Creek at the southwest corner of the Lilypad claims, and a large (4 km) cluster at the center of the claims between Frog Creek and the headwaters of Hayes Creek. Gold does not form well-defined clusters, although the best assays lie in a thin band between Apex Mt. and Crescent Creek. Gold response is weak in the vicinity of Prospector Mt. (except for an isolated assay of 4800 ppb Au), and is also only weakly anomalous on the Nit claims, despite strong arsenic response.

DISCUSSION AND RECOMMENDATIONS

In the United States and elsewhere, bulk-tonnage gold and silver deposits have been discovered by re-exploring vein camps that were previously mined for their high grade, low tonnage deposits. At the Lilypad property, the large number of relatively densely-distributed vein-faults cutting Tertiary volcanics suggests potential for both types of deposit.

These veins are structurally complex, and although their surface traces are simple lineaments, some zones appear to reach 200 m in width and may represent stockwork development that could be mined by open pit methods. Veins are continuous across contrasting lithologies, cutting both volcanics and syenite, but are best developed in the more brittle volcanics. It is not yet known whether veining resulted from regional tectonic stresses (Big Creek -- Hayes Creek Fault?) or plutonic forces, although some combination of both is probable. Associated cross-faulting has been observed in at least one location.

Interrelationships between plutonic and volcanic rocks, dykes and vein-faults suggest a complex history for the Lilypad area. The two kinds of volcanic, Carmacks and Mt. Nansen, are now known to be coeval, and contact-metamorphic effects (hornfels banding) suggest that at least some of the syenites have re-intruded the volcanics. The syenites and volcanics are possibly intrusive and extrusive equivalents of one magmatic system that has undergone several pulses. Heat from the intrusion may have driven a geochemical cell, moving solutions into areas of lower pressure (veins) and higher porosity (volcanic breccia?). The source of mineralization is unknown, but the siliceous nature of the vein-faults suggests a magmatic origin.

Comparison of geochemical results with geology suggests that the intrusive/ extrusive contact is the most important locus of mineralization, possibly due to greater heat, dilatancy or changes in the chemical environment. If so, the shallow southerly dip of the contact suggests the potential for unexposed mineralization at depth in that direction. The NAT crew has not discovered significant evidence of bulk-tonnage type mineralization to date. However, investigation of the wider vein zones may show sufficient mineralization to allow mining by open-pit methods. The veins themselves have good potential for hosting high-grade ore shoots, that may be extractable by standard underground mining. The veins diminish in width upon entering the syenitic rocks, and appear to be only weakly mineralized.

Further work should be divided into regional geochemical sampling and mapping, and property development. A closely-spaced silt-sampling program is required to test extensions of the Lilypad camp to the northwest and southeast, following the regional trend. Low-level air photography and subsequent interpretation for lineaments should be done as an initial stage for continued property work.

After the area is snow-free in mid-June (1981), property work will start with establishing topographic control for detailed prospecting and the mapping of surface traces of all veins and cross-faults. A bulldozer will be walked to the property in mid-summer and several weeks spent trenching and sampling the most promising vein zones so located.

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES LIMITED

E.P. Onasick, B.A.Sc.,P.Eng.

A.R. Archer, B.A.Sc., P.Eng.


NIT 1-36 CLAIMS
DAWSON RANGE
East Hayes Creek
Hayes Creek
Apex Creek
Apex Lake
WILYPAD 1-270 CLAIMS
NEWT 1-132, 135-155 CLAIMS
SEE DETAIL
Figure N8-A
Prospector Mountain
Klotassin R
LOCATION MAP
MAP AREA
LEGEND
x SILT
• SOIL
■ ROCK
~ MISSING VALUE
> GREATER THAN
T TRACE
x 11,12 Au(ppb), As(ppm)
FIGURE N7-A
ARCHER, CATHRO & ASSOCIATES LTD
Au,As GEOCHEMISTRY
HAYES CREEK AREA
NAT JOINT VENTURE
SCALE 1:25,000
500 0 500 1000 1500 2000 2500 Yards
500 0 500 1000 1500 2000 Metres
Association of Professional Engineers of the Yukon Territory
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GEOLOGICAL ENGINEER
To accompany report dated Dec 1980
JAN 1981

FIGURE N7·B

ARCHER, CATHRO & ASSOCIATES LTD

Ag,Pb GEOCHEMISTRY

HAYES CREEK AREA

NAT JOINT VENTURE

SCALE 1:25,000

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LOCATION MAP
SCALE 1:1000000
MAP AREA
LEGEND:
TERTIARY
TMN — MT. NANSEN Acid Volcanics: dark grey weathering, competent, blocky; aphanitic to fine grained, grey, green or black; vitreous to sugary; grades into eTcv
eTcv — CARMACKS Intermediate to Basic Volcanics: brown weathering, rubbly, tuffaceous and/or brecciated; fine grained brown, maroon, pale green and grey and dark grey; commonly amygdaloidal; often propylitically altered (epidote, chlorite, carbonate); grades into TMN
Tqfp — Quartz-Feldspar Porphyry: porphyritic feeder phase of Mt. Nansen and Carmacks volcanics; quartz and feldspar phenocrysts to 1 mm in aphanitic greenish-grey, brownish or mauve matrix; sometimes brecciated
Tgal — Alaskite: coarse grained, leucocratic; quartz-feldspar
Tg — COFFEE CREEK Granite: homogeneous, equigranular, coarse-grained biotite granite/quartz monzonite
CRETACEOUS TO TERTIARY
KTy — Syenite: rusty weathering and fresh, medium to coarse grained, grey to buff; feldspar - biotite - hornblende; propylitically to argillically altered in places
KTyp — Porphyritic (K-feldspar phenocrysts to 15 mm) variety of KTy
KTqm — Quartz Monzonite/Granodiorite: rusty weathering and fresh, medium to coarse grained, grey, buff or pinkish; quartz-feldspar-biotite-hornblende; propylitically to argillically altered in places
KTqmp — Porphyritic (K-feldspar phenocrysts to 15 mm) variety of KTqm
PROTEROZOIC AND/OR PALEOZOIC
PPsn — YUKON GROUP: brownish weathering, grey muscovite-biotite quartzite and quartz-feldspar-mica schist; includes amphibolite and augen gneiss and minor marble undifferentiated
occurrence of mineralization with associated quartz veining, showing strike and reference number (see Table HC-1)
geological contact (defined, approximate, assumed or phase boundary)
thermal metamorphic (?) effects: banded hornfels, aplitic dyking with tourmaline
observed lineation
mapped fault
claim boundary
limit of 1980 mapping
Northern Cordillera Mineral Inventory occurrence (see text)
FIGURE N7-C
ARCHER, CATHRO & ASSOCIATES LTD
GEOLOGY
HAYES CREEK AREA
NAT JOINT VENTURE
SCALE 1:25,000
Yards
Metres
NIT 1-36 CLAIMS
LILYPAD 1-270 CLAIMS
NEWT 1-132, 135-155 CLAIMS
DAWSON RANGE
LIMIT OF MAPPING
East Hayes Creek
Hayes Creek
Apex Creek
Annelia Creek
Peter Creek
Frog Creek
Newt Creek
Prospector Mountain
Apex Mountain
Apex Lake
62°30'
62°25'
138°10'
138°05'
138°00'
137°55'
137°50'
137°45'
A. R. ARCHER
GEOLOGICAL
ENGINEER
1981

Hoyes
Creek
Frog Creek
New Creek
Prospector Mountain
LOCATION MAP
LEGEND
X SILT
• SOIL
■ ROCK
– MISSING VALUE
> GREATER THAN
<1,T TRACE
• 5,26 Au (ppb), As (ppm)
FIGURE N8·A
ARCHER, CATHRO & ASSOCIATES LTD
Au, As GEOCHEMISTRY
LILYPAD PROPERTY (DETAIL)
NAT JOINT VENTURE
SCALE 1:10,000
300 200 100 0 100 200 300 400 500 600 700 Metres
1/4 0 1/4 1/2 Miles
Association of Professional Engineers of the Yukon Territory
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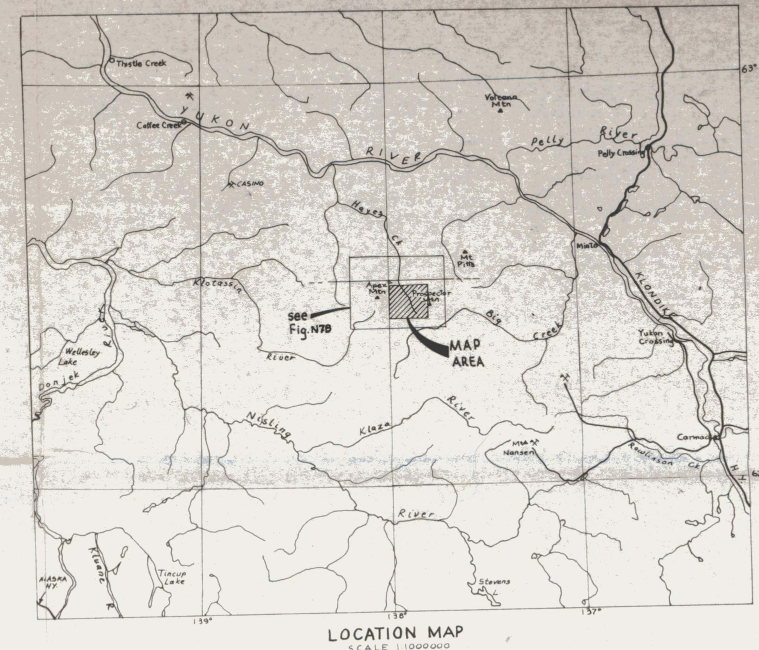
GEOLOGICAL ENGINEER
To accompany report dated Dec. 1980
JAN 1981



LOCATION MAP

LEGEND

X SILT
• SOIL
■ ROCK
– MISSING VALUE
> GREATER THAN
10K=10,000

6,34 Ag x 10, Pb ppm

FIGURE N8·B

ARCHER, CATHRO & ASSOCIATES LTD

Ag, Pb GEOCHEMISTRY

LILYPAD PROPERTY (DETAIL)

NAT JOINT VENTURE

SCALE 1:10,000

300 200 100 0 100 200 300 400 500 600 700 Metres

1/4 0 1/4 1/2 Miles

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GEOLOGICAL ENGINEER

To accompany report dated Dec 1980 JAN 1981