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REPORT ON

GEOLOGY AND GEOCHEMISTRY

KOKUP 1-24 CLAIMS

Claim Sheet 115J/9 & 10

Whitehorse Mining District

Dawson Range, Y.T.

for

Denison Mines Ltd.

by

R.J. Cathro, B.A.Sc., P.Eng.

January 1981

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

$ 9,600.00

Resident Geologist or
Resident Mining Engineer

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

E. R. BAXTER
Supervising Mining Recorder

Commissioner of Yukon Territory

INDIAN and NORTHERN AFFAIRS

TRANSMITTAL FORM

M.R. File No. 340-13-2
S.M.R. File No. _____
Date Fwd. _____

FROM: Mining Recorder at Whitehorse

TO: Supervising Mining Recorder at Whitehorse, Y.T.

Office of the Supervising Mining Recorder
MAR 3 1981
WHITEHORSE
Yukon Territory

FOR ACTION ARE:

- ☐ NEW APPL'N for PLACER LEASE to PROSPECT: Name:
- ☐ RENEWAL APPL'N PLACER LEASE to PROSPECT: Name: Lease No.
- ☐ AFFIDAVIT of EXPENDITURE on PLACER LEASE. Name. Lease No.
- ☐ ASSIGNMENT of PLACER LEASE No.
  From: To:
- ☐ GROUPING APPL'N UNDER SEC. 52(2) PLACER MINING ACT.
  Owner:
- ☐ DIAMOND DRILL LOGS
  Claims: Claim sheet no:
- ☑ QUARTZ ASSESSMENT REPORT
  Claims: KoKup 1-24 Claim sheet no. 115-J-9/10
  Type of report: Geology & Geochemistry Submitted by: Archer, Cathro & Associates Ltd.
  Cls. work performed on: $ Req. for ren. application 9,600.00

3 MAR '81
Signature

REPLY ACTION. Date Ret.

Signature

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ILLUSTRATIONS

SUMMARY AND RECOMMENDATIONS

The Kokup property is situated at Mt. Cockfield in the Dawson Range in south-central Yukon, some 25 km southeast of the Casino copper/molybdenum porphyry property. During the discovery of the Casino deposit in 1969, the Dawson Range was extensively explored resulting in discovery of copper/molybdenum geochemical anomalies around Mt. Cockfield. Subsequent drilling in the northwest corner of this area located weak hydrothermal alteration and low grade copper/molybdenum mineralization in the Mt. Cockfield quartz monzonite stock. A complex igneous history is indicated by the presence of two stages of granitic intrusion followed by two periods of intermediate to felsic volcanism. The acid volcanics are of the same composition and character as some of the rocks found at the Casino deposit.

The 1980 program was designed to evaluate whether the copper/molybdenum geochemical anomalies on the Kokup property represent a Casino-type subvolcanic center. Mapping shows that the felsic volcanics are terrestial ash flows deposited away from their eruptive source and that the property has little similarity to Casino, although the adjacent area to the south and east needs further study to ensure the eruptive center has not been overlooked.

Some of the rock samples collected during the 1980 survey are anomalous for gold, silver, arsenic and lead, although no mineralization other than minor arsenopyrite has been found to explain these anomalies. These rocks consist of intermediate to felsic volcanics which have been periodically invaded by quartz-porphyry dykes, containing significant amounts of pyrite. This is suggestive of some large tonnage low-grade gold and/or silver deposits, where precious metal is found peripheral to or incorporated within porphyry hydrothermal systems.

The 1980 rock samples and the 1969 soil samples should be reanalyzed so that the content of Au, Ag, As, Sb, Hg, Cu, Mo, Bi and Pb are known. Anomalous areas will require more detailed close-spaced sampling from the residual C rock and clay horizon (or failing this from the finest size of talus present). Reconnaissance sampling should be extended south and east of the Kokup property. Exposures of Casino and Mt. Nansen volcanics both on the Kokup property and nearby should be prospected in detail to ascertain if mineralized veining is present. The Kokup property has several years of assessment and more extensive work on the property could wait until work has proceeded on similar targets in the Dawson Range toward Carmacks. Development of these other gold/silver targets may aid understanding of the Kokup property.

INTRODUCTION

The Mt. Cockfield prospect has been held by Archer, Cathro since 1969, initially on behalf of the Dawson Range Joint Venture. The present claims were staked in October, 1977 and optioned in 1980 to Denison Mines Ltd., which financed a mapping program and geochemical study between August 10 and 20, 1980. The program was conducted by M.P. Phillips and Doug Oneschuk under the supervision of R.J. Cathro. Jim Morin and assistant M. Smith of DIAND visited the crew on August 18-19 and contributed valuable interpretation of the volcanic rocks.

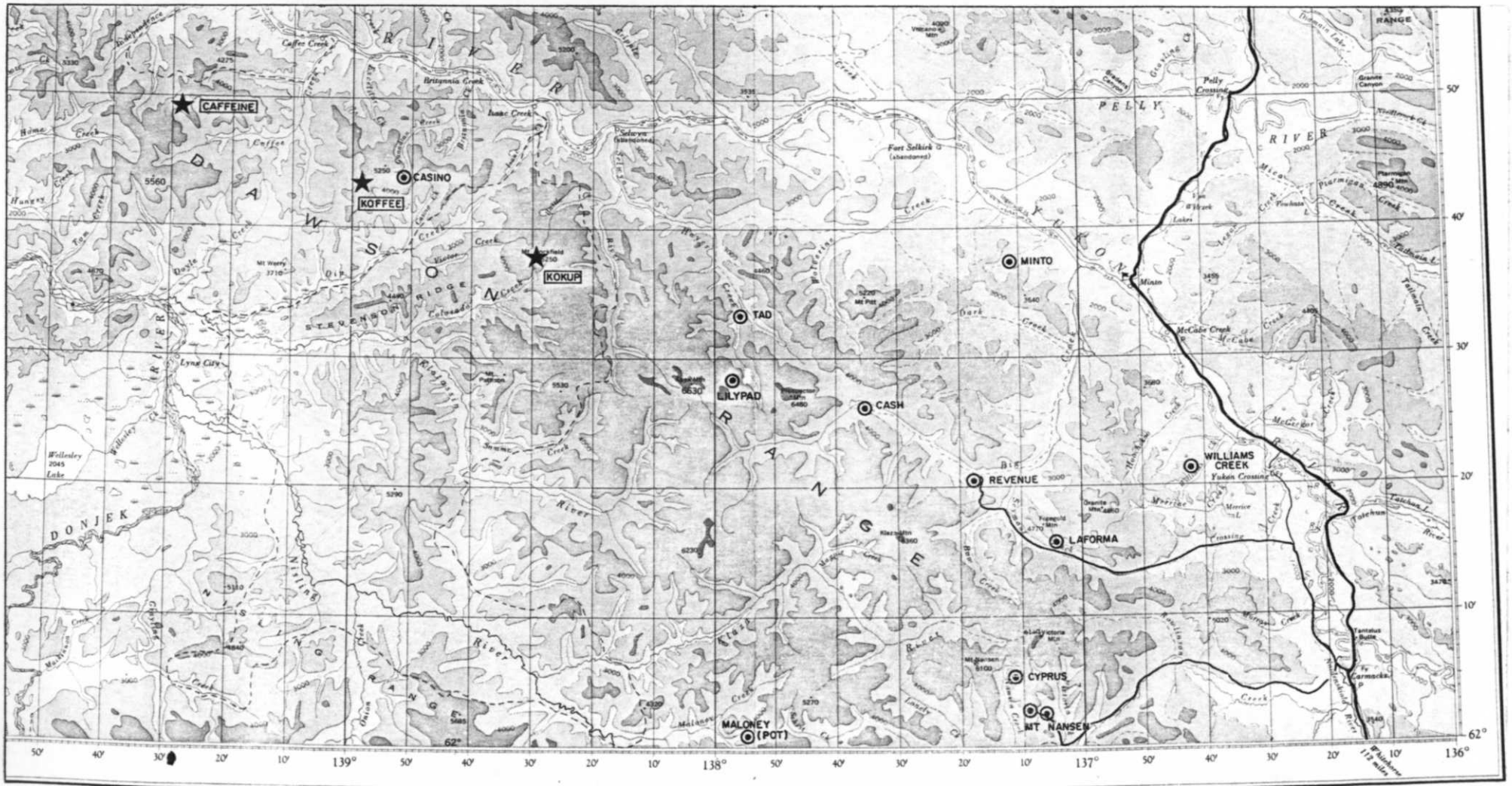
PROPERTY, LOCATION AND ACCESS

The property is located on Mt. Cockfield in the Dawson Range, Y.T., at 62°36'N and 138°30'W within NTS claim sheets 115J/9 and 115J/10 (see Figure 1 on the following page). The nearest settlement is Carmacks, 129 km to the southeast. Carmacks is 117 km by the all-weather-gravel Klondike Highway from Whitehorse. An airstrip suitable for DC-3 aircraft is present on the Casino property, 25 km northwest.

The property consists of 24 contiguous claims recorded in the name of Archer, Cathro & Associates Limited at the Whitehorse Mining Recorder's office. Details are as follows:

Claim Name	Tag No.	Expiry Date
Kokup 1-8	YA22201-08	7 October, 1984
Kokup 9-24	YA48327-42	7 October, 1984

Cominco Ltd. tied on the Battle group to the north in April, 1980.



LEGEND

★ ARCHER, CATHRO PROPERTY

⊙ MINERAL DEPOSIT

FIGURE 1

ARCHER, CATHRO & ASSOCIATES LTD

LOCATION MAP

KOKUP PROPERTY—DENISON MINES LTD

SCALE — 1:1,000,000

10 5 0 10 20 30 40 Km

5 0 5 10 15 20 25 Miles

HISTORY

Mt. Cockfield was first recognized as a porphyry target in June, 1969, during the initial drilling of the Casino deposit, by two crews working independently of one another. The northwest side was staked first by Newmont following investigation of a preselected aeromagnetic target, while the Dawson Range Joint Venture (Molycorp, Inc; B.X. Development Ltd; Straus Exploration Inc; Great Plains Development Corporation; Marietta Resources International Ltd.), managed by Archer, Cathro & Associates Limited, staked the southeast side a few days later when anomalous geochemical response was obtained from the gossaned porphyry environment. The Newmont and Dawson Range JV properties were completely surrounded by fringe stakers in the next few weeks during the Casino staking rush.

Both the Newmont and Dawson Range JV claim blocks were partially mapped and grid soil sampled in 1969, and Newmont also conducted a magnetometer survey. The Archer, Cathro mapping was performed by Dick Culbert. Induced Polarization and rock geochem surveys and six widely-spaced holes, totalling 1397 m, were completed on the Newmont claims under an option in 1970 by United Keno Exploration, a joint venture between United Keno Hill Mines, Falconbridge and Canadian Superior Oil. No work has been performed at Mt. Cockfield since 1970.

When the original claims lapsed the main portion of both properties was restaked by Archer, Cathro in 1976 as the Cofield 1-34 group. These subsequently lapsed and were restaked as the Kokup group.

Cominco performed soil sampling on the Battle claims to the north in 1979 and 1980.

PHYSIOGRAPHY

The property is situated in the Dawson Range, a northwesterly-trending disected plateau consisting of rounded hills and ridges averaging about 300 m but locally reaching 700 m of relief. Mt. Cockfield, one of the highest peaks in the Dawson Range at 1900 m elevation, lies on a divide separating creeks on the north and east that drain to the Yukon River and those on the south and west that flow to the Klotassin River. The Yukon Plateau escaped Pleistocene continental glaciation although small cirque-shaped valleys indicate that local alpine glaciers have been present on Mt. Cockfield in some earlier stage. The mountain is being strongly incised by stream erosion and slopes consist of unstable fine talus trains. Most of the mountain lies above timberline and is subject to extreme frost shattering.

REGIONAL GEOLOGY

The regional geology has been mapped by Dirk Tempelman-Kluit in 1970 to 1973 and 1979 and published in GSC Papers 73-41 and 80-1A. In addition, Colin Godwin conducted an intensive study of the Casino Volcanics as part of his Ph.D. Thesis on the Casino Deposit, which was completed at U.B.C. in 1975. Rock units on the Kokup property shown on Figure 2 (in pocket) are identified from these regional studies.

YUKON METAMORPHIC COMPLEX (Schist-Gneiss Unit - PPsn)

The oldest rocks in the region are screens and pendants of metasedimentary rocks that belong to the Yukon Metamorphic Complex, which has been divided into a number of lithologically distinct units. Near Mt. Cockfield and Casino, the complex consists mostly of the informally named Schist-Gneiss unit (PPsn) composed of muscovite-biotite quartzites, quartz-mica schist and minor amphibolite of Upper Devonian to Mississippian age (Tempelman-Kluit). The Schist-Gneiss unit occurs south of the property in a large pendant or screen which narrows toward the Mt. Cockfield volcanics and reoccurs on the north end of the mountain as a smaller pendant. Foliation trends NNW and dips steeply near Mt. Cockfield. Greenstone and amphibolite are common and schist, gneiss and feldspathic metaquartzite occur in lower sections of the unit. Bedding is not recognizable. On the ridge west of East Battle Creek, the contact between metasediments and the Mt. Cockfield pluton is surprisingly gradational although in places the contact is narrow and migmatitic. Pyritization is occasionally present near volcanic dykes.

KLOTASSIN SUITE (Rqdm)

The Klotassin Suite forms the core of the Dawson Range, intruding the Yukon Metamorphic Complex with contacts that are generally conformable to foliation.

Klotassin plutons are characterized by a general absence of biotite, weak pervasive chloritization, and weak foliation imparted by subparallel orientation of mafics. They are predominantly quartz diorite with local quartz monzonite phases. Near Mt. Cockfield, the batholith is a medium-grey, medium-grained, commonly foliated hornblende granodiorite. Hornblende is the principal mafic although biotite occurs locally. Phenocrysts of coarse-grained orthoclase are common.

COFFEE CREEK SUITE (Kqm)

The Cretaceous Coffee Creek plutons are similar in appearance to the Klotassin Batholith but are generally finer grained and vary in composition from porphyritic quartz monzonite to quartz monzonite porphyry. The Mt. Cockfield stock is probably correlative with the Coffee Creek Suite. At Mt. Cockfield, the porphyry contains hornblende, biotite and pink orthoclase phenocrysts and is not as well fractured as the non-porphyritic variety. Minor amounts of coarse molybdenum and chalcopyrite are occasionally present in quartz veinlets that occupy some of the fractures. Mineralization is rare along dry fractures.

'DAWSON RANGE' VOLCANIC SUITE

Dawson Range Volcanic Suite is the informal name for an assemblage of Eocene to Miocene, acid to basic plug domes, ash flows, subvolcanic breccia pipes, dykes and small porphyritic plutons. These rocks occur intermittently along the axis of the Dawson Range for a length of over 60 miles from about Carmacks to the White River.

The base of the volcanic suite consists of a dark coloured structureless unit called the Mt. Nansen Volcanics (Tmn). This is overlain by the Casino Volcanics (Tva), which consist of layered felsic ash flows or subvolcanic

rhyodacite breccia pipes. Feldspar porphyry (Tfp) consist of north-trending dyke swarms which cut and are cut by Mt. Nansen and Casino rocks. In a few places, feldspar porphyry forms small, high-level porphyritic plugs that are genetically associated with most of the precious and base-metal mineralization in the region.

PROPERTY GEOLOGY

The geology of the Kokup property is plotted on Figure 2 (in pocket). Mt. Cockfield is mainly composed of a Tertiary volcanic/subvolcanic complex (Dawson Range Volcanic Suite) that cuts and overlies the north end of a roof pendant of Yukon metamorphic complex within the Triassic Klotassin granodiorite batholith. The Keno Hill and Newmont work was concentrated in and around the small, weakly altered Mt. Cockfield quartz monzonite stock that is exposed at the northwest edge of the Tertiary volcanic complex.

MOUNT NANSEN VOLCANICS

The Mount Nansen Volcanics (Tmn) are dark grey or black-weathering dacites which are often covered with a rind of black lichen. On fresh surfaces, the rock is greenish grey, aphanitic and usually structureless. In places, the rock becomes porphyritic with up to 30% fine to medium grained phenocrysts of euhedral feldspars resembling the feldspar porphyry unit. Fine grained biotite and hornblende are sometimes present and disseminated pyrite (up to 2%) and magnetite (up to 15%) are common. Occasional white partings may represent air-fall ash tuff. Breccia fragments up to 2.5 cm across are sometimes seen on weathered surfaces but cannot be seen on fresh surfaces.

Tempelman-Kluit initially thought the Mt. Nansen Volcanics were formed during explosive volcanism but in his more recent work (Paper 80-1A, p. 361) he refers to these rocks as formed in plug domes.

CASINO VOLCANICS

At the Casino property, the Casino Volcanics have been extensively removed by erosion to expose brecciated tuffs coeval with a small circular feldspar porphyry plug of rhyodacite composition. Fragments of porphyry in the breccia

indicate that the porphyry predates the volcanic phase. Godwin radiometrically dated the Casino Volcanics as Late Cretaceous (70.3 m.y.) and showed conclusively that they are the source for the copper and molybdenum mineralization accompanying hydrothermal alteration. This mineralization and alteration has also been superimposed onto the older plutonic wall rocks.

'Casino Volcanics' at Mt. Cockfield had been thought to be generally similar to their counterparts at the Casino property (i.e. an intrusive/extrusive acid volcanic centre). This 1980 study has shown that the Casino acid volcanics on Mt. Cockfield are gently dipping, rhyolitic ash flow breccias. These are considered to be ignimbrites formed from the terrestial consolidation of a turbulent mixture of gas and pyroclastic material that was blown horizontally at great speed from an adjacent volcanic centre. They typically weather blonde to light grey in colour and weather into finely sized talus. In all, a 250 m thickness of ash flows is exposed on the top of Mt. Cockfield and nearby.

Two extrusive ignimbrite events are evident. The earlier (called Cooling Unit A) overlies the Mt. Nansen volcanic erosion surface at peak 5950, a km northeast of Mt. Cockfield. A subsequent series of ignimbrite (called Cooling Unit B) overlies the Mt. Nansen volcanics erosion surface on Mt. Cockfield itself and overlies Cooling Unit A on peak 5950 (see sections A-B, C-G, and H-Q, Figures 3-5, on following pages). The exposures of ignimbrites on Mt. Cockfield and peak 5950 extend over an area at least 2 km in length. Previous Archer, Cathro projects mapped exposures of 'Casino Volcanics' lying 1 km east of the Kokup property and also others extending south of Mt. Cockfield. The nature of these other exposures has not been evaluated.

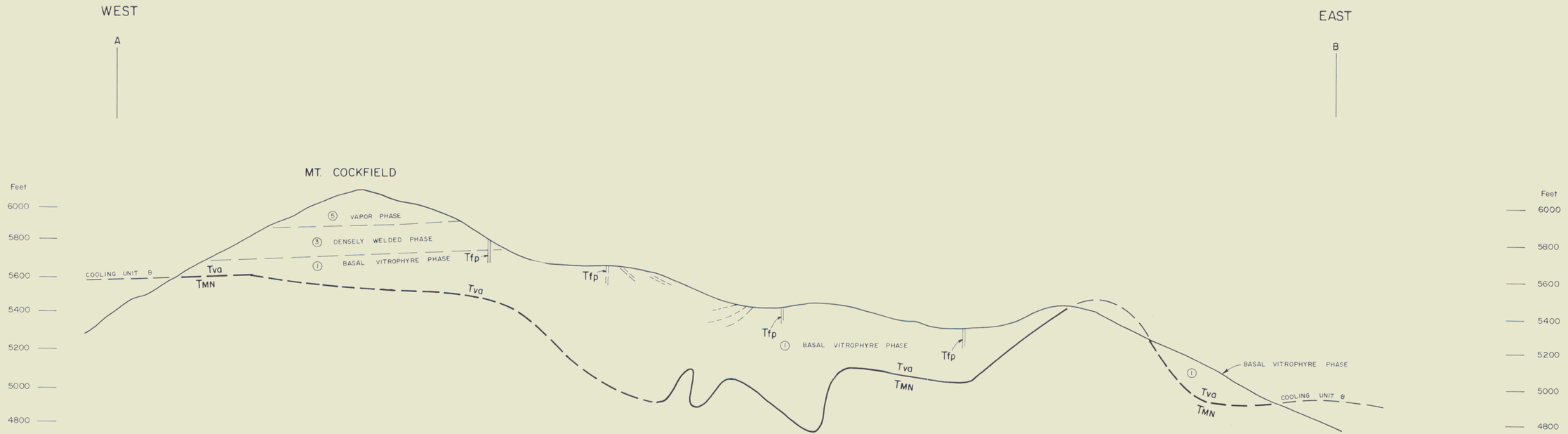
Each ash flow cooling unit usually consists of three parts: a lower Basal Vitrophyre Phase, a central Densely Welded Phase and an upper Vapor

FIGURE 3

ARCHER, CATHRO & ASSOCIATES LTD

SECTION A-B

KOKUP PROPERTY-DENISON MINES LTD



FACING NORTH

--- flow banding

SCALE
(HORIZONTAL AND VERTICAL)
1:4800

MAP# 115 J/9 E10 Doc# 090767 (406)

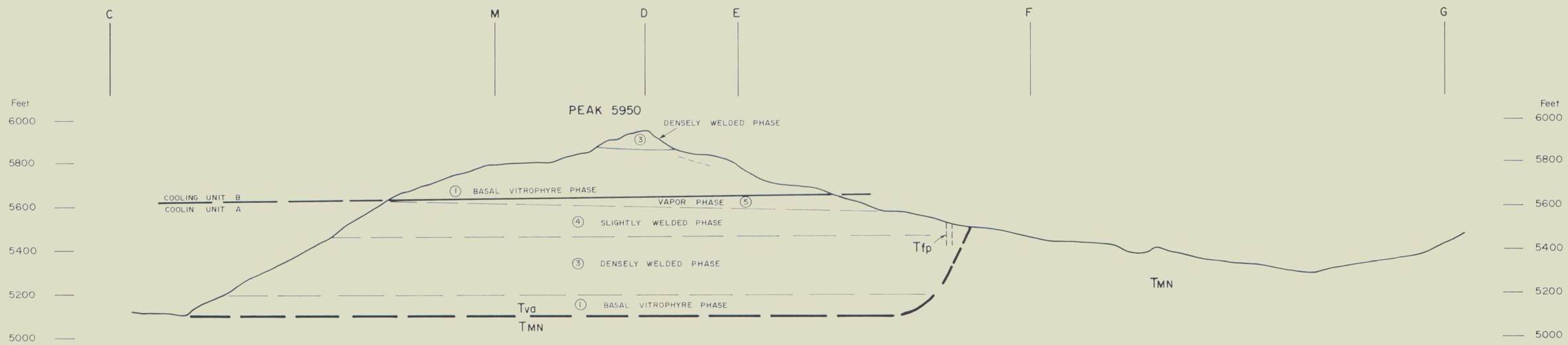
To accompany report dated January, 1981

FIGURE 4

ARCHER, CATHRO & ASSOCIATES LTD

SECTION C-G

KOKUP PROPERTY-DENISON MINES LTD



FACING NORTH

SCALE

(HORIZONTAL AND VERTICAL)

1: 4800

--- flow banding

407

MAP #1153/9 & 10 Doc #090767

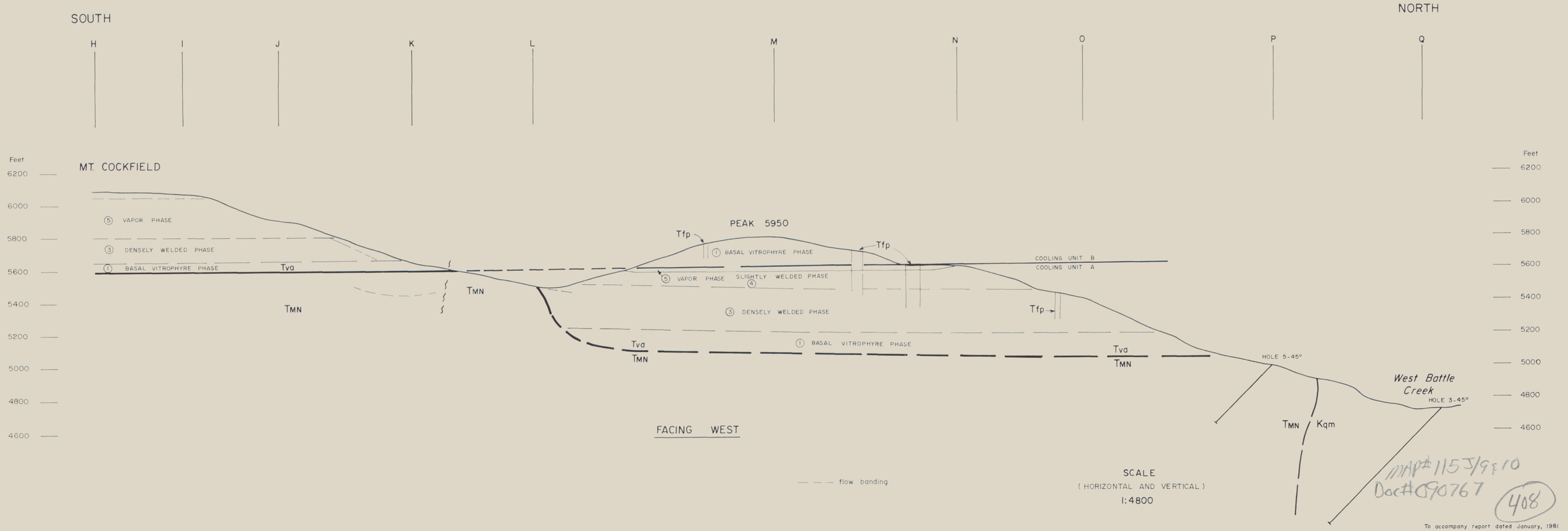
To accompany report dated January, 1981

FIGURE 5

ARCHER, CATHRO & ASSOCIATES LTD

SECTION H-Q

KOKUP PROPERTY-DENISON MINES LTD



MAP# 115J/9&10
Doc# 690767
408

To accompany report dated January, 1981

Phase. Interruptions in the cooling rate by multiple ash flows can complicate the order, resulting in some zones being absent. For example, an ash flow deposited in and spilling over a bedrock depression would have the typical zoning at the center but only the Basal Vitrophyre Phase at the edge of the depression.

Basal Vitrophyre is typically a dark grey, glassy rock with flow banding and fine feldspar phenocrysts. Lithic and vitric clasts are rare or unrecognizable. Pyrite laminations are common on the ridge east of the summit of Mt. Cockfield. This phase is a result of fast cooling of the bottom contact layer while the unit is still flowing.

The Densely Welded Phase results from a combination of a high residual and lithostatic load, which causes the clasts to be plastically flattened and often indistinguishably welded. The upper and lower contacts of this zone are transitional. On Mt. Cockfield, devitrification textures such as spherules, a result of residual heat, are common and are best seen on weathered surfaces.

The Vapor Phase is characterized by strong clay alteration and the presence of circular cavities up to 10 mm across that are often limonitic and lined with quartz crystals and acicular black tourmaline. On Mt. Cockfield, tourmaline content averages 3 to 5% and ranges up to 15%.

In all three phases, the breccia clasts are mainly composed of light grey lithic fragments from 2 mm to 30 mm in diameter, with subordinate vitric shards, with generally the same composition as the matrix. The breccia matrix is glassy and light grey containing up to 50% euhedral feldspar crystals (microlites) less than 0.5 mm in diameter. Minor hornblende, chlorite and quartz microlites are sometimes present. Pyrite content averages 2% and ranges from 1 to 5%. It occurs throughout the unit as fracture fillings, disseminations and laminae

paralleling flow banding. Where the rock has been well fractured, weathering of the pyrite produces strong gossans. Traces of chalcopyrite and molybdenite were seen throughout this unit.

The source of the ignimbrites is unknown and no eruptive centre has been recognized on the property.

FELDSPAR PORPHYRY

Both the Mt. Nansen and Casino Volcanics are cut by Feldspar Porphyry (Tfp) dykes. They are generally north-trending and vertically dipping and average about 1.5 m in width. These dykes comprise some 5% of the rock float on the property. They contain up to 30% fine euhedral to subhedral phenocrysts of feldspar in a light grey, aphanitic matrix. Phenocrysts of pink orthoclase up to 2.5 cm are common in some dykes. Biotite and hornblende content ranges from 2 to 5%. Up to 10% disseminated magnetite and up to 3% pyrite are the principal metallic minerals but traces of chalcopyrite and molybdenite are also present. A few porphyry dykes have a matrix resembling Mt. Nansen Volcanics.

STRUCTURE

Apart from north-trending faulting evident from the feldspar porphyry dyke systems, the only recognized regional structure is a ring system recognizable from air photo mosaics. This ring structure is plotted on Figure 2. It is not apparent on the ground and the only evidence of its existence are arsenopyrite bearing veins in Drill Hole 5 and minor arsenopyrite bearing float from the east central part of the property (an area of anomalous gold rock-geochem values).

DIAMOND DRILLING

Six holes drilled by United Keno Explorations in 1970 at the head of West Battle Creek are plotted on Figure 2, in pocket. Five of the holes were drilled in the Mt. Cockfield Stock (Kqm). Most of these holes were split and assayed for copper and molybdenum, with the following results:

Hole	Depth	From (ft.)	To (ft.)	% Cu	% Mo
1	859	35	859	0.021	0.014
2	712	9	712	0.037	0.013
3	1022	9	1022	0.024	0.015
4	986	9	986	0.022	0.010
	including	810	820		0.079
6	505	52	62	0.029	0.112
		174	195	0.022	0.077

The sixth hole (Hole 5) was drilled in Mt. Nansen volcanics and was not assayed by United Keno, although it appears to have intersected similar mineralization as well as minor arsenopyrite veining. In 1979 most of the core from Hole 5 was found but it could not be accurately located within the hole because the footage markers had been obliterated. Fifteen boxes, representing about 300 feet of the 500 foot hole, were grab sampled and assayed individually to provide an approximate estimate of the grade. The arithmetic average of the fifteen assays was 0.031% Cu and .001% Mo.

MINERALIZATION

Mt. Cockfield was originally staked over a copper-molybdenum geochemical anomaly, and drilling by United Keno Explorations showed that low grade mineralization is associated with the Cretaceous Mt. Cockfield stock. This drill testing of the Mt. Cockfield stock indicated that alteration and weak copper/molybdenum mineralization is related to late-stage fracturing. Since hole 5 in the overlying Mt. Nansen volcanics is similarly altered and mineralized, although to a lesser degree, the mineralizing event is likely coeval with later emplacement of Casino volcanics and the pervasive feldspar porphyry dyke systems. Fractures average 3/16 inch wide, varying from 1/32 to 3/4 of an inch, and are filled with quartz, calcite and ankerite. Pyrite, chalcopyrite, molybdenum and magnetite are generally associated with quartz veinlets. In Hole 3, a two-foot wide fault zone contained chalcopyrite, molybdenite, pyrite, galena and arsenopyrite. In general, mineralization is scant and alteration is low grade (phyllic to minor argillic) and restricted to late stage veining. No zoning has been recognized that would suggest the presence of a Casino-type tectonically active eruptive center. Despite this lack of encouragement, the anomalous molybdenum response at the northeast corner of the Kokup property is not related to known mineralization and warrants continued study.

The 1980 program concentrated on the mineral potential of the volcanic rocks. In the Mt. Nansen Volcanics pyrite is common as minor disseminations replacing mafic minerals and as veinlets along north-trending fractures. Fracture density averages 3 or 4/m but can be up to 40/m. Generally trace amounts of chalcopyrite and molybdenite are associated with pyrite mineralization. The strongest pyrite mineralization seen on the property occurs near United Keno's Hole 5. Magnetite is also common in the Mt. Nansen Volcanics, averaging 2% and

ranging up to 15%, occurring as patchy disseminations with minor fracture fillings. Minor arsenopyrite was seen in some rock samples with anomalous gold geochemistry.

Throughout the Casino Volcanics pyrite is common, ranging up to 5%, mainly as fracture fillings with lesser amounts of disseminated pyrite. Laminated pyrite occurs in the Basal Vitrophyre Phase on the ridge east of the summit of Mt. Cockfield. Trace amounts of disseminated chalcopyrite and molybdenite are associated with the pyritic mineralization. Sulphide content is generally much lower in the porphyry dykes than in the volcanic rocks.

ALTERATION

T. Eyde of Superior Oil studied thin sections of United Keno Exploration's drill core in 1980 and reported weak potassic alteration in quartz monzonite with thin orthoclase rims, plagioclase phenocrysts and veinlets of biotite and orthoclase. In addition, ankerite veinlets and weak disseminated magnetite substantiate this inrepretation.

The Mt. Nansen Volcanics contain weak pyritization and pervasive chloritization of the mafics indicating propylitic alteration, possibly derived from deuteric alteration accompanying the cooling of the rocks. A narrow phyllic zone, evident as bleached envelopes around pyritic fractures, is located near the quartz monzonite contact immediately north of Hole 5. This pattern of a weak potassic core in the Mt. Cockfield quartz monzonite, rimmed by a narrow phyllic zone grading to a wide propylitic zone within the Mt. Nansen Volcanics, resembles the type of alteration zoning associated with undersaturated rocks where the potassic core is surrounded by a propylitic zone with a phyllic zone that may or may not be present. Gold is often associated with such hydrothermal alteration in undersaturated rocks.

Generally, hydrothermal alteration is slightly stronger in the Mt. Nansen Volcanics than in the Casino Volcanics where hydrothermal alteration has only been weakly developed, mainly confined to three flat lying argillic zones within the Vapor Phase on the ridge east of the summit. This lack of alteration may be related to the lack of Casino-type diatremes. Weakly disseminated magnetite in the Densely Welded Phase and tourmaline in the Vapor Phase Zone are probably also alteration minerals.

GEOCHEMISTRY

Field and Analytical Procedures

The 1969 soil sample grid was established using chained baselines marked with 1 m lathe. Sample stations were determined by pace and compass and marked with flagging. In most cases a sample of "B" soil horizon was selected. However, in talus areas where there is little soil, samples consisted of "C" horizon.

The 1980 sample sites were located approximately using an airphoto mosaic and stations were marked with flagging. Most samples collected in 1980 consisted of rock chips. Soil samples were screened and the -80 fraction was analyzed for copper and molybdenum using a nitric-perchloric acid extraction and atomic absorption determination. Rock samples were crushed and screened to -80 mesh and tested as for soil samples with additional analysis for lead and silver. As well, arsenic was determined using an arsenic-hydride vapour technique and gold was determined using fire assay followed by atomic absorption ('combo' technique).

Discussion

Figures 6, 7 and 8 (in pocket) are plots of Cu, Mo, Pb, As, Au and Ag values from rock samples collected during the 1980 program. The Cu and Mo values from soil samples collected during the 1969 survey are included on Figure 6.

This property was staked for its copper-molybdenum porphyry deposit potential and attention has been focused on the areas with anomalous copper and molybdenum silt and soil response (Figure 6). Most of the 1969 work was performed on the north and east sides of Mt. Cockfield where values are most strongly anomalous, particularly the Mt. Cockfield stock (Kqm), the Klotassin batholith (T qdm) and, to a lesser extent, the Mt. Nansen Volcanics (Tmn) which cap these intrusive rocks.

The threshold values for the Kokup property are approximately Pb - 150 ppm; Ag - 2 ppm; As - 100 ppm; and Au - 10 ppb. A number of the 1980 rock samples are clearly anomalous in all four elements. While several of these anomalies lie within the Casino acid volcanics, in general these rocks do not have encouraging values. The fewer number of samples taken from the Mt. Nansen volcanics are more consistently anomalous. It is not clear whether there is an unrecognized relationship between these anomalous samples and a ring (caldera) structure or to contacts with underlying intrusions and more mapping and sampling data is required for evaluation. Approximately 225 rock samples were selected in 1980 on a random basis with no preference to rock type or mineralization. Of these, 19 contained over 10 ppb Au and 11 contained over 2.0 ppm Ag. A subsequent examination of these revealed 6 of the gold rich contained traces of arsenopyrite but that there were no other distinguishing features.

CONCLUSIONS

Prior to 1980, Mt. Cockfield was interpreted as a porphyry copper target capped by post-ore volcanic flows because of superficial similarities to the nearby Casino deposit. The 1980 mapping has shown that the surface expression of the porphyry-type mineralization and alteration is extremely weak. However, in the course of that study it became apparent that the volcanic rocks themselves are potential hosts for bulk-type gold or silver mineralization.

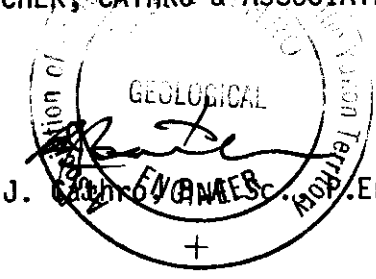
Casino volcanics at Mt. Cockfield are composed of terrestial ash flow deposits (ignimbrites) that are strongly fractured, cut by porphyry dykes and weakly pyritized. Traces of arsenopyrite have been noted in a few surface specimens. The ignimbrite rocks extend off the claims to the east and south. These terrestial ignimbrites have no intrusive component. No eruptive center was found or suggested. The copper-molybdenum response from these rocks is low to minor and they have no potential for a Casino deposit although their eruptive source and older rocks fractured by the eruptive event may have excellent potential for copper/molybdenum mineralization.

Mt. Cockfield lies along the remarkably linear trend of the Dawson Range as shown on Figure 1, following page 3. The well known gold camp northwest of Carmacks (Mt. Freegold, Revenue, etc.) is currently being restudied and sampled to determine if it has geological similarities to low grade, large tonnage precious metal deposits in the U.S.A. and elsewhere where silver and gold mineralization is found associated with the caldera formation of felsic volcanic eruptive centers. Many of the characteristics of such deposits (resurgent felsic to intermediate terrestial volcanism with attendant rock fracturing, alteration, and pyritization), are reminiscent of the Mt. Cockfield geological setting. Results on nearby properties will aid in interpreting the

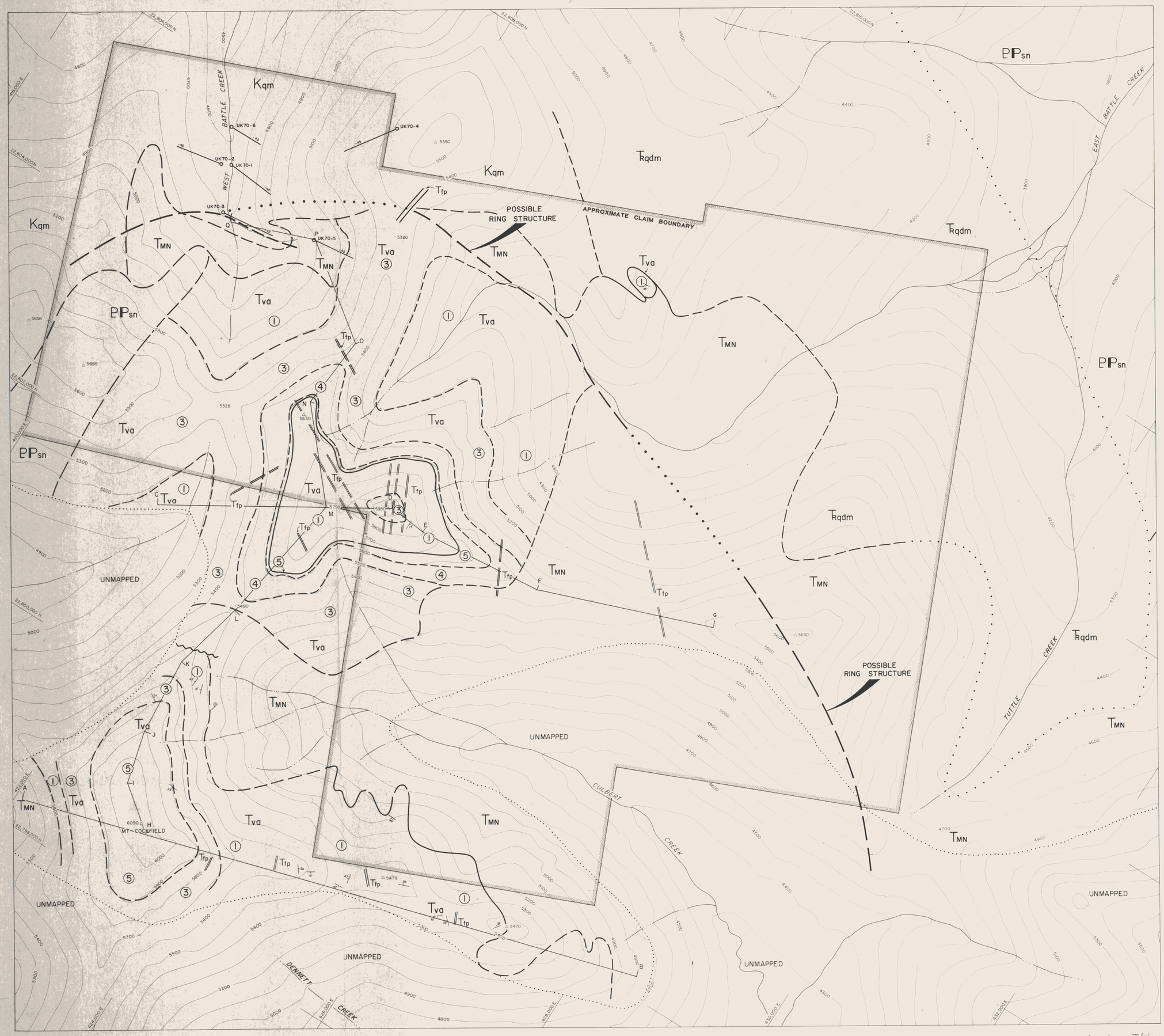
Kokup property.

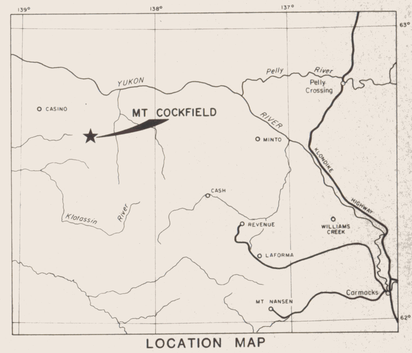
Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES LIMITED



R.J. Cathro, M.Sc., P.Eng.





LOCATION MAP

SCALE - 1:1,000,000

0 10 20 30 40 50 60 Km

0 10 20 30 40 Miles

LEGEND

CENOZOIC

EOCENE?

DAWSON RANGE VOLCANIC SUITE

- Tfp — FELDSPAR PORPHYRY – dyke rocks
- Tva — CASINO VOLCANICS – acid ignimbrite
  - (5) vapor phase
  - (4) transitional phase
  - (3) densely welded phase
  - (2) transitional phase
  - (1) basal vitrophyre phase
- TMN — MOUNT NANSEN VOLCANICS – acid to intermediate volcanic flows and diatreme breccia

MESOZOIC

CRETACEOUS — **COFFEE CREEK SUITE**

- Kqm — MT COCKFIELD STOCK – porphyritic quartz monzonite

TRIASSIC — **KLOTASSIN SUITE**

- Trqdm — KLOTASSIN BATHOLITH – hornblende granodiorite – commonly foliated

PALEOZOIC

- PPsn — YUKON METAMORPHIC COMPLEX Schist–Gneiss Unit – schists, gneiss, amphibole and orthogneisses

geological contact (known, approximate, assumed)

fault

bedding attitude

UK70-4 — UNITED KENO diamond drill hole, 1970

FIGURE 2

ARCHER, CATHRO & ASSOCIATES LTD.

GEOLOGY

KOKUP PROPERTY

MT. COCKFIELD, YUKON

DENISON MINES LIMITED

SCALE - 1:4800

400 200 0 400 800 1200 Feet

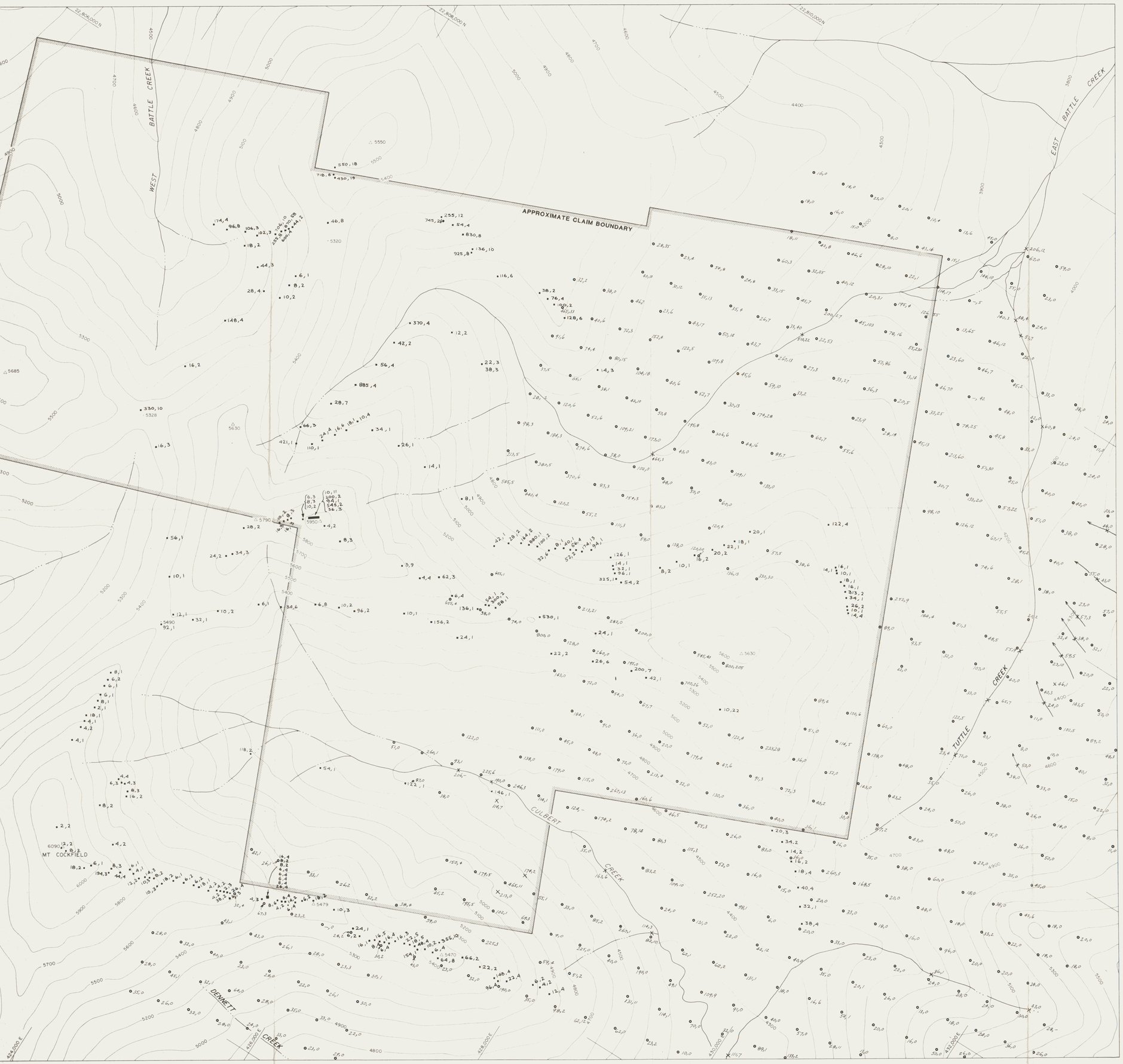
100 50 0 100 200 300 400 Metres

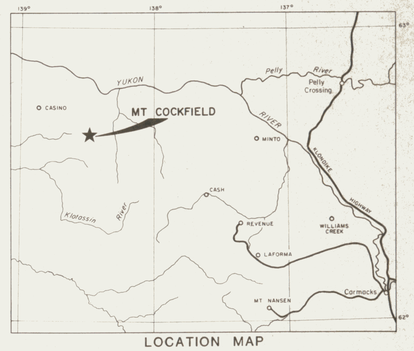
Association of Professional Engineers of the Yukon Territory — R. J. CATHRO — GEOLOGICAL ENGINEER — Jan 15/81

To accompany report dated January, 1981

MAP# 115 3/9+10 Doc# 090767 (4/2)

090767





LOCATION MAP

SCALE – 1:1,000,000

0 10 20 30 40 50 60 Km

0 10 20 30 40 60 Miles

LEGEND

- 26,5 ■ 1980 rock assay
- 18,2 • 1980 soil assay
- 76,4 ○ 1969 soil assay
- 465,3 X 1969 silt assay

} copper, molybdenum in ppm

Note: – 1969 sample locations approximate only

FIGURE 6

ARCHER, CATHRO & ASSOCIATES LTD.

COPPER – MOLYBDENUM GEOCHEMISTRY

KOKUP PROPERTY

MT. COCKFIELD, YUKON

DENISON MINES LIMITED

SCALE – 1:4800

400 200 0 400 800 1200 Feet

100 50 0 100 200 300 400 Metres

J. CATHRO PROFESSIONAL ENGINEER YUKON TERRITORY GEOLOGICAL ENGINEER

To accompany report dated January, 1981

MAP#115 3/93 ID Doc#090767 (410)

APPROXIMATE CLAIM BOUNDARY

WEST BATTLE CREEK

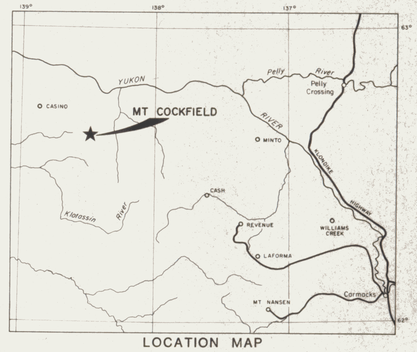
EAST BATTLE CREEK

TUTTLE CREEK

CULBERT CREEK

DENNETT CREEK

MT COCKFIELD



LOCATION MAP

SCALE - 1:1,000,000

0 10 20 30 40 50 60 Km

0 10 20 30 40 Miles

LEGEND

46,5 ■ 1980 rock assay } lead, arsenic in ppm

• 1980 soil assay }

FIGURE 7

ARCHER, CATHRO & ASSOCIATES LTD.

LEAD – ARSENIC GEOCHEMISTRY

KOKUP PROPERTY

MT. COCKFIELD, YUKON

DENISON MINES LIMITED

SCALE - 1:4800

400 200 0 400 800 1200 Feet

100 50 0 100 200 300 400 Metres

Association of Professional Engineers of the Yukon Territory
R. J. CATHRO
GEOLOGICAL ENGINEER
Jan 1981

MAP#115 J/9&10 Doc#090767 (409)

To accompany report dated January, 1981

APPROXIMATE CLAIM BOUNDARY

WEST BATTLE CREEK

EAST BATTLE CREEK

TUTTLE CREEK

CULBERT CREEK

DENNET CREEK

MT COCKFIELD

22,808,000 N

22,806,000 N

22,810,000 N

22,804,000 N

22,802,000 N

22,800,000 N

22,798,000 N

426,000 E

428,000 E

430,000 E

432,000 E

434,000 E

LOCATION MAP

SCALE - 1:1,000,000

0 10 20 30 40 50 60 Km

0 10 20 30 40 Miles

YUKON

CASINO

MT COCKFIELD

Pelly River

Pelly Crossing

RIVER

MINTO

Stewart

Klondike

Highway

Klotassin

River

CASH

KEVENUE

WILLIAMS CREEK

LAFORMA

Carmacks

MT NANSEN

139°

138°

137°

63°

62°

z z, /z • 1980 rock assay

• 1980 soil assay

} gold, silver in ppb, ppm

FIGURE 8

ARCHER, CATHRO & ASSOCIATES LTD.

GOLD - SILVER GEOCHEMISTRY

KOKUP PROPERTY

MT. COCKFIELD, YUKON

DENISON MINES LIMITED

SCALE - 1:4800

400 200 0 400 800 1200 Feet

100 50 0 100 200 300 400 Metres

To accompany report dated January, 1981

MAP #115 J/9 & 10 Doc #810767 (411)