

# The Scheelite Dome gold project, central Yukon

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## ABSTRACT

La Teko Resources Ltd. acquired the Scheelite Dome gold property from Kennecott Canada Exploration Inc. in 1998. Kennecott had explored the central Yukon property since 1994. The strongly deformed Yusezyu Formation of the Upper Proterozoic-Lower Cambrian Hyland Group underlies the property and is intruded by unfoliated mid-Cretaceous granitic stocks, dykes and sills of the Tombstone Plutonic Suite (TPS). Vein-type (both metasediment- and granite-hosted), skarn and replacement mineralization on the property is associated with the TPS intrusives.

Mapping, trenching and drilling by Kennecott identified numerous structurally controlled metasediment-hosted zones of mineralization within an east-west 3.5 km by 1.4 km > 40 ppb, gold soil anomaly. In 1997, a 13 hole 1052 m reverse circulation drill program tested the gold soil anomaly with the two best holes returning weighted averages of 0.48 g/t gold over 29 m (RC97-4) and 0.41 g/t gold over 61 m (RC97-11). In 1998, a seven hole 1268 m diamond drill program by La Teko tested targets defined using a combination of soil and rock gold anomalies, geological structures and chargeability and resistivity anomalies. Results included intersections of 1.04 g/t gold over 14.9 m, 1.07 g/t gold over 12.1 m, and 3.67 g/t gold over 7.7 m.

## RÉSUMÉ

La Teko Resources Ltée a acquis la propriété Scheelite Dome de Kennecott Canada Exploration inc. en 1998. Kennecott explorait cette propriété, située au centre du Yukon, depuis 1994. Le substrat rocheux, très déformé sur la propriété, appartient à la formation d'Yusezyu du groupe de Hyland qui date du Protérozoïque au Cambrien inférieur et qui est pénétrée par des stocks, des dykes et des filons- couches granitiques non feuilletés du Crétacé moyen de la suite plutonique de Tombstone (SPT). La propriété est caractérisée par des indices minéralisés associés aux roches intrusives de la SPT tels que les skarns, les indices de type filonien (recoupant les roches métasédimentaires ainsi que les roches granitiques) ainsi que la minéralisation de remplacement.

Les travaux de cartographie, de creusage de tranchées et de forage exécutés par Kennecott ont permis d'identifier de nombreuses zones minéralisées au sein d'une anomalie de sols de 3,5 sur 1,4 km, d'orientation est-ouest et renfermant plus de 40 parties par 10<sup>6</sup> d'or. La minéralisation est régie par des facteurs structuraux et est encaissée dans les roches métasédimentaires. En 1997, on a exécuté un programme de 13 sondages à circulation inverse totalisant 1052 m afin d'éprouver l'anomalie et ces trous ont recoupé des teneurs moyennes pondérées de 0,48 g/t d'or sur 29 m (RC97-4) et de 0,41 g/t d'or sur 61 m (RC97-11). En 1998, La Teko a exécuté un programme de forages au diamant dans le cadre duquel 7 forages totalisant 1268 m ont permis d'éprouver des cibles définies d'après des anomalies de sol et de roches, des structures géologiques et des anomalies de chargeabilité et de résistivité. Les résultats comprennent, entre autres, des recoupements de 1,04 g/t d'or sur 14,9 m, de 1,07 g/t d'or sur 12,1 m, et de 3,67 g/t d'or sur 7,7 m.

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## INTRODUCTION

The Scheelite Dome gold project (Yukon Minfile 115P 003) is located near Mayo in central Yukon (Fig. 1). La Teko Resources Ltd. ("La Teko") has an option to earn a majority interest in the property from Kennecott Canada Exploration Inc. ("Kennecott") through fulfilling certain obligations.

The exploration target on the property is a metasediment-hosted gold deposit genetically related to Tombstone Plutonic Suite (TPS) granitic intrusions. Mineralization identified to date lies largely within a 3.5 km by 1.4 km, > 40 ppb gold-in-soil anomaly defined by Kennecott in 1996 (Fig. 1). The area has good road access and excellent exploration potential both within the large soil anomaly and elsewhere on the property.

## PROPERTY HISTORY

Placer gold was first discovered in this area in 1884 and placer mining continues to the present day (Kreft, 1993). Although the first lode claims were staked in 1916 (Yukon Minfile) the property has not seen any hard rock mineral production to date. The area has been re-staked several times since by Yukon prospectors and a number of mineral exploration companies.

Mr. Rudy Riepe staked the Gant and Ade claims, which form part of the current property, in 1986 and 1987, and optioned them in 1991 to H6000 Holdings Ltd. ("H6000") who had also

staked a large block of surrounding claims. Exploration staff of H6000 were the discoverers of the Fort Knox gold deposit located near Fairbanks, Alaska and the Dublin Gulch gold deposit located 35 km to the northeast of Scheelite Dome. Both deposits are hosted by intrusions now included within the TPS (Poulsen et al., 1997). H6000 explored the Scheelite Dome and Minto Lake stocks for Fort Knox-type deposits with soil geochemical surveys, geological mapping and trenching. Results of this work were discouraging (Kajszo, 1992).

In 1994, Kennecott staked 60 claims in the area as part of a regional reconnaissance program. Soil and stream sediment sampling, geological mapping and prospecting indicated widespread zones of metasediment-hosted auriferous quartz-arsenopyrite mineralization. Additional claims were staked as the H6000 claims expired and in 1995 the Gant and Ade claims were optioned to Kennecott.

In 1995 and 1996, Kennecott conducted further soil sampling, excavated 19 trenches totalling 1 linear km in length, flew a 1275 line-km DIGHEM V helicopter electromagnetic, magnetic and VLF survey over the entire property and produced 5 m contour orthophoto maps from contracted aerial photography. An 8-hole diamond drilling program totalling 1035 m tested mineralized metasedimentary exposures in Hight Creek.

During 1997, a total of 9 km of roads were constructed to access the large gold-in-soil anomaly which was then tested with 13 reverse circulation drill (RVC) holes totalling 1052 m and

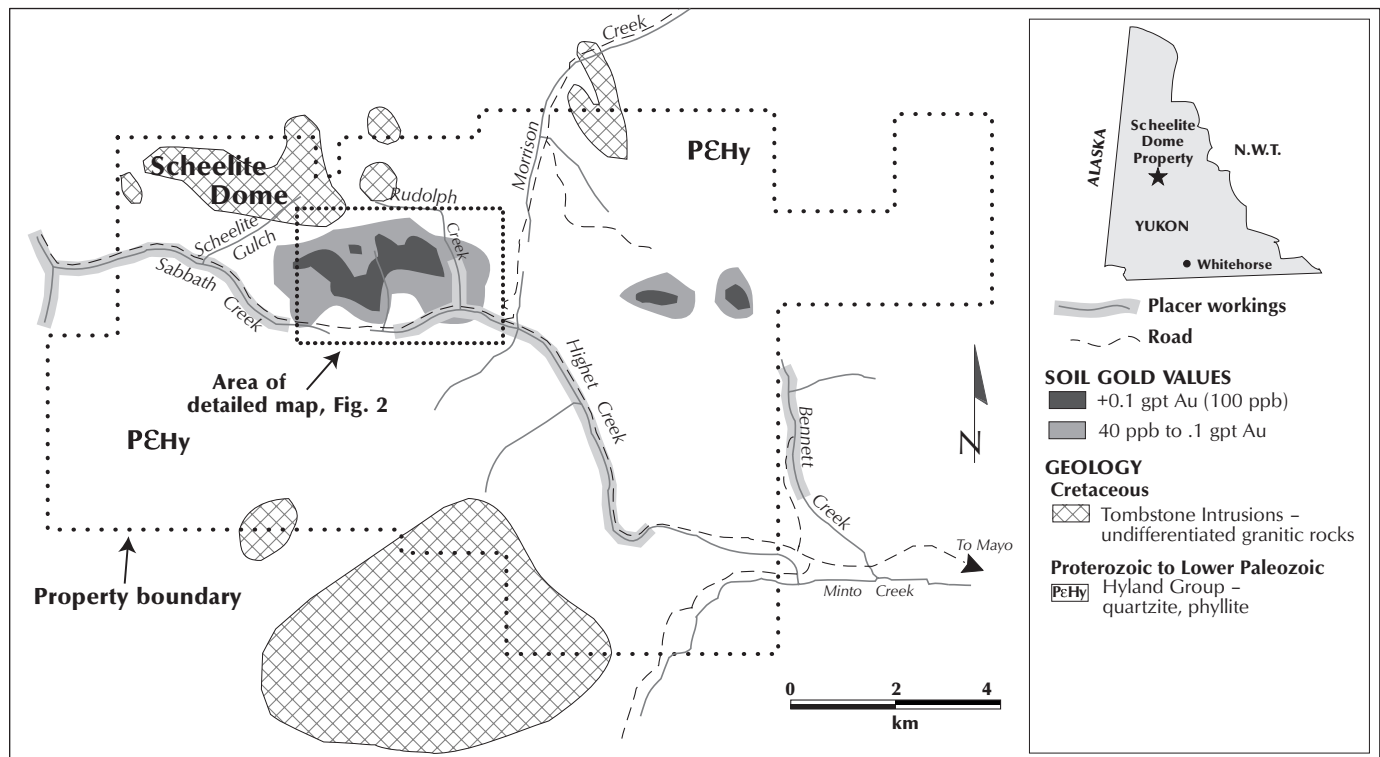


Figure 1. Scheelite Dome property, geology and geochemistry.

eight excavator trenches totalling 1.7 linear km. The intensely fractured rock caused drilling problems and resulted in several holes being abandoned short of their target depth.

In 1998, La Teko optioned the property from Kennecott and conducted a 12.4 km induced polarization program followed by seven diamond drill holes totalling 1268 m. The drilling tested targets defined using a combination of features, including soil and rock gold anomalies, geological structures, and chargeability and resistivity anomalies. The results of this program are discussed below.

## PROPERTY GEOLOGY

The property is underlain by the Yusezyu Formation, a siliciclastic unit of the Upper Proterozoic-Lower Cambrian Hyland Group (Murphy, 1997). The metasedimentary rocks include strongly foliated muscovite-chlorite phyllites, quartzofeldspathic and micaceous psammities ("quartzites"), and gritty psammities that locally form massive outcrops. Rare marble and calc-silicate layers are best developed in the northwest of the property in the vicinity of the Cominco Zone, located on the north side of the Scheelite Dome Stock, although pods and boudins of marble and limy psammite can be found throughout the property.

The property is located on the south-dipping limb of the southwesterly striking McQuesten Antiform within the Tombstone Strain Zone (Murphy, 1997). This package of rocks lies above the northeasterly vergent Tombstone Thrust. Fold and thrust deformation is believed to have occurred in Late Jurassic or Early Cretaceous times. A strong, northeasterly striking, moderately southeast dipping foliation affects the metasedimentary rocks and is the most prominent ductile fabric on the property. Small-scale isoclinal folds and crenulations are common.

The regional foliation is crosscut by three sets of moderately to steeply dipping fault and joint structures that strike east-west, northwest-southeast and north-south, respectively. The east-west and northwest-southeast structures host mineralization and therefore have received the most attention. The north-south structures are only rarely mineralized, have normal down-to-the-west displacement and appear to truncate and offset east-west structures. All of the structures form topographic lineaments.

The above structures were formed either during development of the McQuesten Antiform or as a result of faulting accompanying igneous emplacement. Alternatively, the structures may be extensional features related to a short-lived period of regional north-south extension coeval with Tombstone suite magmatism (Goldfarb, 1997).

Following Jura-Cretaceous deformation, the Yusezyu Formation was intruded by metaluminous and reduced I-type granitic intrusions of the 94-90 Ma TPS. The three stocks on the property, at Scheelite Dome, Morrison Creek and Minto Creek,

have been dated at  $91.2 \pm 0.9$  Ma,  $92.5 \pm 2.5$  Ma and  $92.2 \pm 0.3$  Ma, respectively (Murphy, 1997). The undated Minto Lake Stock lies to the south. All four stocks are massive, salt and pepper gray, medium grained quartz-, biotite- and hornblende-bearing granite with local feldspar megacrysts. Contact metamorphic aureoles containing biotite and andalusite surround the intrusions.

Thin, medium to fine grained felsic to intermediate dykes and sills, commonly quartz and/or feldspar porphyries, and narrow (< 1 m wide) lamprophyre dykes are probably part of the TPS. The dykes preferentially intrude the east-west structures.

## MINERALIZATION

The property covers a coincident arsenic-gold-tungsten-antimony stream sediment anomaly identified by a GSC regional stream sediment sampling survey. This anomaly reflects the widespread occurrence of arsenopyrite and the more discrete occurrences of gold, scheelite and stibnite. The metallogenic signature also includes anomalous values for Ag, Bi, Mo, Pb and Te as do other examples of TPS intrusion-related mineralization.

The following four types of bedrock mineralization are recognized on the Scheelite Dome property:

1. structurally controlled metasediment-hosted quartz-sulphide veins;
2. skarn;
3. Fort Knox-type granite-hosted low sulphide veins;
4. replacement-type occurrences.

### STRUCTURALLY CONTROLLED METASEDIMENT-HOSTED QUARTZ-SULPHIDE VEINS

Auriferous quartz veins are found throughout the property both within and outside the thermal aureole of the stocks. These veins are the main cause of the Scheelite Dome gold-in-soil anomaly. The veins commonly contain fine grained tourmaline as well as arsenopyrite,  $\pm$  stibnite,  $\pm$  galena,  $\pm$  pyrite and they vary from breccia veins up to several metres in width occupying major fault zones, to thin quartz veinlets filling joint sets, locally close spaced and described as sheeted veins. Visible gold, found in a number of localities, usually occurs in association with arsenopyrite. Vein-wallrock contacts are sharp with narrow (commonly < 1 cm wide) selvages defined by bleaching, sulphidation, sericitization, silicification and tourmalinization. However, metasedimentary rocks crosscut by the veins are limonite-stained and are commonly weathered to depths of 10-15 m or more, implying the former presence of widely dispersed sulphides.

Two important vein sets have been identified: an east-west set that shares the orientation of the soil gold anomaly and a

**PROPERTY DESCRIPTIONS**

northwest-southeast set located within the soil anomaly in the Hawthorne Ridge area. The east-west vein set dips moderately to steeply north, and consists mainly of mm-thick veinlets filling joint sets and as rarer veins up to a metre wide. The veinlets and veins are commonly spaced 0.25 m to 1 m apart within discrete zones of fracturing and are preferentially developed within massive quartzite. Granitic dykes intruding the same structures have phyllic alteration, are auriferous and may contain up to several percent disseminated arsenopyrite and/or pyrite.

Gold mineralization intersected in drilling and trenches is typified by numerous zones (tens of metres wide) of low-grade (0.4-0.5 g/t) gold interspersed with zones of narrow higher grade mineralization. Rock samples from excavator trenches across east-west trending mineralization returned 0.66 g/t gold over 33 m and 0.43 g/t gold over 50 m from trenches approximately 750 m apart. Diamond drill holes 98-11 and 98-12, testing an east-west structure 500 m east of the trenches, returned 1.07 g/t gold over 12.1 m and 3.67 g/t gold over 7.7 m, respectively. A reverse-circulation drill hole (RC97-11), testing an east-west structure 1 km east of the trenches, returned 0.41 g/t gold over 61 m (with the drill hole abandoned at 61 m) while a diamond drill hole (98-10) returned 1.04 g/t gold over 14.9 m. Numerous high-grade grab samples of quartz veining, some with visible gold, returned greater than 10.0 g/t gold.

The northwest-southeast vein set dips to the northeast and is exemplified by the Hawthorne quartz-arsenopyrite-stibnite

breccia vein. The vein is up to 1 m wide and pinches and swells within an 8 m wide zone of shearing, bleaching and sericite alteration. A parallel zone of jointing, veining and minor shearing approximately 8 m wide occurs in the footwall. The fault which the vein occupies, named the Hawthorne Structure (Fig. 2), is thought to extend for at least 3 km and is believed to cut and offset a portion of the Scheelite Dome intrusion. Rock chip samples collected across the Hawthorne Vein, including hanging-wall wallrock and the footwall zone, returned 0.53 g/t gold over 49 m, although individual chip samples returned up to 1.53 g/t gold over 0.40 m. The reverse circulation drill hole (RC97-3) that tested the possible eastward extension of the Hawthorne Vein returned 0.49 g/t gold over 19.8 m, with low arsenic and stibnite values. Diamond drill hole 98-14 tested this target and returned 1.04 g/t gold over 20 m. Reverse-circulation drill hole RC97-4, located approximately 250 m northeast of RC97-3, tested a northwest striking structure and returned a weighted average of 0.48 g/t gold over 29 m before it was abandoned after entering a fault zone.

Low-angle gouge (thrust?) zones that are locally auriferous have been identified in placer mining exposures along Hight Creek. At the Merle Pit Zone, a gently undulating 0.5-1.0 m wide arsenopyrite-bearing grey gouge zone crosscuts bleached and sericitized phyllitic quartzite and phyllite. A grab sample of the arsenopyrite-bearing gouge returned 7.5 g/t gold while chip samples over a strike length of 65 m and a width of 2.5 m returned a weighted average of 0.70 g/t gold.

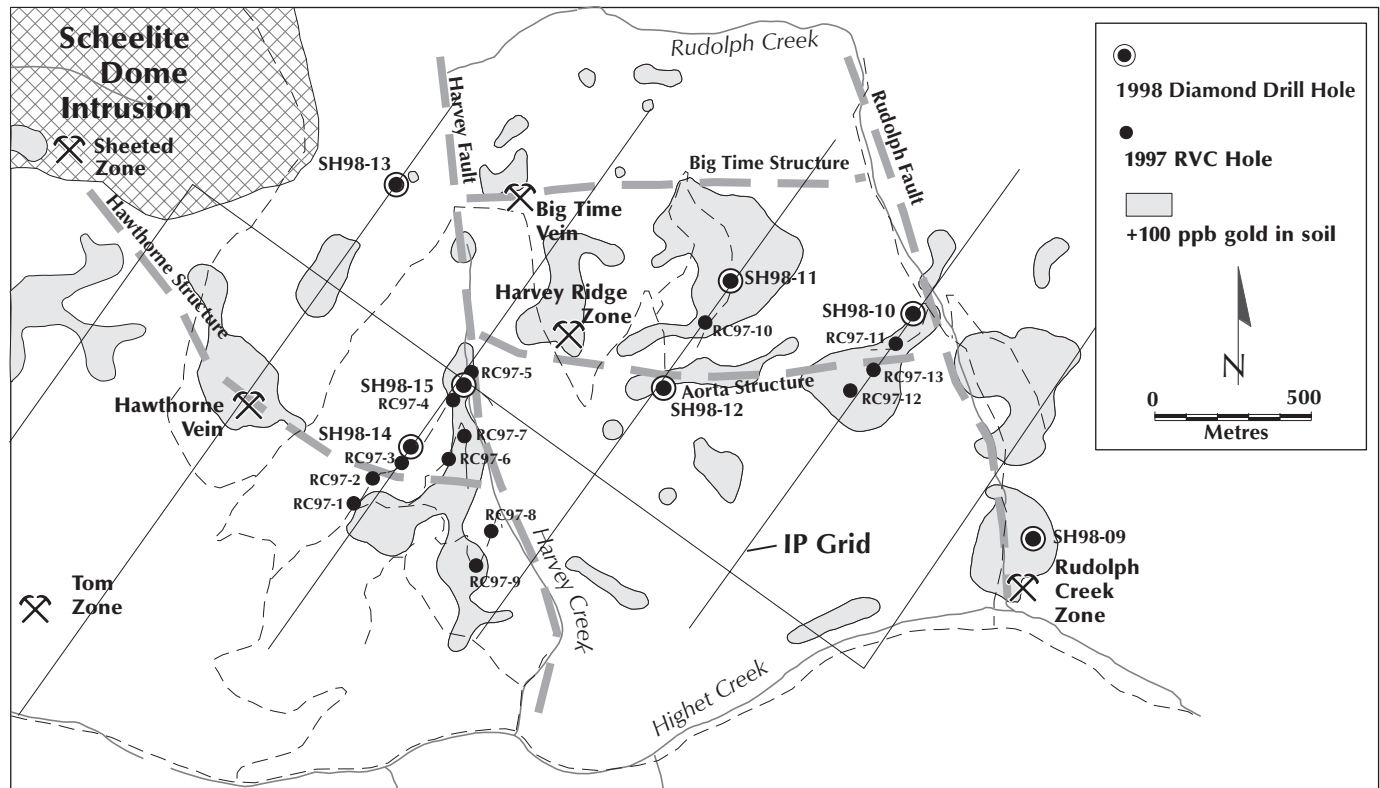


Figure 2. Scheelite Dome property, 1998 drill holes.

## SKARN

The Cominco Zone, located on the north side of the Scheelite Dome Stock, is an auriferous garnet-wollastonite-quartz-tremolite exoskarn with disseminations and clots of pyrrhotite, scheelite and chalcopyrite. The skarn is developed within a thin (< 10 m wide) band of massive marble along the intrusive contact. Cominco Ltd. trenched the zone in 1979 and tested it with three NQ-size diamond drill holes. The best intersection was 7.9 m of skarn averaging 0.95 g/t gold. Rock samples of pyrrhotite-bearing skarn collected by Kennecott returned between 0.68 g/t and 5.72 g/t gold, while sulphide-poor skarn returned < 0.74 g/t gold. The economic potential of the skarn appears to be low as the zone is well exposed and skarn widths are narrow at surface.

## FORT KNOX-TYPE GRANITE-HOSTED LOW SULPHIDE VEINS

The Sheeted Zone (Fig. 2) is a small zone (250 m by 150 m) of quartz-feldspar-muscovite-scheelite-tourmaline stockwork near the head of Scheelite Gulch. The zone may be the northwest extension of the Hawthorne Structure. The veins which are similar in appearance to auriferous veins at the Fort Knox and Dublin Gulch gold deposits, are generally barren of gold although rare mineralized grab samples collected by H6000 returned up to 24.61 g/t gold (Kajszo, 1992). Three phases of veining are present, each with narrow (< 1 cm) selvages of sericitization, silicification and bleaching. Early thin milky white feldspar-quartz veinlets are crosscut by white to light grey quartz veinlets with minor feldspar which in turn are crosscut by white to grey quartz veinlets. The last two vein sets contain variable but generally minor arsenopyrite.

## REPLACEMENT TYPE

Significant replacement mineralization has been located in Hight Creek, Harvey Creek and in the Tom Zone and lesser amounts of replacement mineralization are common elsewhere on the property. It is commonly restricted to fine to medium grained meta-quartzite containing minor amounts of calcite. Mineralization consists of disseminated (frequently > 1%) to semi-massive arsenopyrite, commonly as stubby euhedral crystals, in discontinuous foliaform bands < 10 cm thick. Such mineralization is found adjacent to steep to moderately dipping gouge zones and adjacent to narrow (< 2 cm wide) steeply dipping quartz-filled joints with silicified, sericitized and bleached selvages.

With the exception of the Tom Zone, gold geochemical results from these zones are disappointing although arsenic values frequently exceed the detection limit of 10,000 ppm. Interestingly, one of the better zones intersected in a diamond drill hole in Hight Creek returned 1.20 g/t gold over 4.4 m with arsenic values < 1000 ppm. Rock samples from a replaced marble unit in the Tom Zone returned values up to 11.76 g/t

gold, > 10,000 ppm arsenic, 288 ppm bismuth and 2120 ppm tungsten over 0.6 m.

As mineralized quartz veins crosscut both the foliated metasediments and massive unfoliated granites, the majority of mineralization formed following intrusion emplacement. Fluid inclusions from crosscutting quartz veins collected from both the Scheelite Dome Stock and the metasedimentary rocks in Hight Creek are of low salinity (0 to 4 wt.% NaCl equivalent), CO<sub>2</sub>-rich and have homogenization temperatures between 260 and 350°C (Pierce, 1996; T. Baker, pers comm., 1997). Pierce (1996) concluded that the fluids were a mixture of magmatic and meteoric waters. No correlation between fluid inclusion temperature, salinity and distance from the intrusion/hornfels zone was apparent.

## GEOPHYSICS

Magnetic contrast over the property is less than 200 nT. Most of the known mineralized areas lie within magnetic and resistivity lows, including the Heon Grid, Bleiler and Merle zones, all located east of Morrison Creek, and parts of the Hawthorne and Harvey Zones. Electromagnetic anomalies are frequently coincident with fault structures and lithological units and contacts.

A 12.4 line-km induced polarization survey was completed in 1998. The surveys were conducted in the time domain with a dipole-dipole array and a dipole separation of 50 m. Several chargeability and resistivity anomalies at depth correlate with structures identified at surface within areas of strong gold in soil anomalies.

## DIAMOND DRILLING (1998)

In 1998, La Teko conducted a seven-hole reconnaissance diamond drilling program. A total of 1268 m of drilling was carried out on targets selected within a 2.1 km by 1.2 km area (Fig. 2). The drill holes ranged in length from 147 m to 216 m. Four holes were vertical and the balance were drilled at an azimuth of 215° and dips varying from 45° to 60°.

The drilling tested targets selected using a combination of controlling features, including gold-in-soil and rock anomalies, and chargeability and resistivity anomalies from the 1998 induced polarization survey. The targets were within a strong east-west striking gold mineralized system as outlined by anomalous gold-in-soils and bedrock over an area 4 km by 1.5 km.

Each of the drill holes intersected primarily quartzite and phyllite metasedimentary units with minor dykes. Within the drilling numerous sections were variably silicified and contained sulphide mineralization, including arsenopyrite, pyrite, pyrrhotite and stibnite (see Mineralization, Metasediment-hosted veins). Crosscutting quartz veins also occurred in various sections.

## PROPERTY DESCRIPTIONS

The drill hole results are summarized in the following table:

Drill hole	From metres	To metres	Length metres	Gold g/tonne
98-09	25.2	33.6	8.4	0.829
	50.0	52.0	2.0	0.751
	58.0	61.0	3.0	0.712
98-10	80.0	94.9	14.9	1.043
	90.9	93.9	3.0	2.620
98-11	99.8	111.9	12.1	1.073
	170.5	*171.3	0.8	1.650
98-12	16.3	24.0	7.7	3.668
98-14	65.6	85.6	20.0	1.037

\* End of hole

True widths cannot be calculated until further drilling is completed. Two holes did not have any intercepts greater than 1.0 g/t gold. All holes, including these two, had numerous intercepts with gold greater than 100 ppb.

## CONCLUSIONS

Mineralization is found over a large area on the Scheelite Dome property. The most significant mineralization explored to date occurs as quartz-sulphide veins within discrete structures that crosscut metasediments. Replacement style mineralization is of secondary importance. East-west zones of weakness are occupied by dykes and, following intrusion, served as channelways for gold-bearing fluids, developing quartz-sulphide veins. These structures are crosscut and truncated by unmineralized north-south faults. Blocks downropped or uplifted by these later faults may juxtapose different structural levels and styles of mineralization.

Consideration will be given in the next phase of work to include the following elements in search of a structurally controlled bulk mineable gold deposit:

- step-out drilling on mineralized zones discovered this year;
- drill test other similar targets in the immediate area of the successful 1998 drill program;
- drill test additional targets with geological, geochemical and geophysical anomalies;
- conduct a more detailed induced polarization survey, a technique which successfully highlighted targets within the larger gold anomaly;
- further develop other geochemically anomalous areas on the 114 square km outside of the initial drill-tested area of 2.5 square km.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Goldfarb, R.J., 1997. Metallogenic evolution of Alaska. *In*: Mineral Deposits of Alaska, Economic Geology, Monograph No. 9, p 4-34.
- Kajszo, J., 1992. Assessment report on the Che, Hig and Mex claims; H6000 Holdings Ltd. Mineral Resources Directorate, Yukon, Indian and Northern Affairs Canada, Assessment Report #93052.
- Kreft, B., 1993. Placer mining and exploration compilation (NTS 105M and 115P). Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, Open File 1993-10 (G).
- Hornbrook, E.H.W. and Friske, P.W.B., 1988. Regional stream sediment and water geochemical data, central Yukon (115P, part of 105M). Geological Survey of Canada, Open File 1650.
- Murphy, D. C., 1997. Geology of the McQuesten River region, northern McQuesten and Mayo map areas, Yukon Territory (115P/14,15,16; 105M/13,14). Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, Bulletin 6, 122 p.
- Pierce, T., 1996. A study of mineralization and quartz veining in the Scheelite Dome intrusion and surrounding country rock. B.Sc. Honours Thesis, University of Victoria, British Columbia.
- Poulsen, K.H., Mortensen, J.K. and Murphy, D.C. 1997. Styles of intrusion-related gold mineralization in the Dawson-Mayo area, Yukon Territory. *In*: Current Research 1997-A, Geological Survey of Canada, p. 1-10.
- Yukon Minfile. Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada. Also available from Hyperborean Productions, Whitehorse, Yukon.