

# Structural settings and geochemistry of the Cynthia gold prospect, Tintina Gold Belt, Hess River area (105O/6), Yukon

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## ABSTRACT

The Cynthia property overlies a large (greater than 2x2 km) area of gold mineralization related to a Cretaceous Tombstone Suite quartz monzonite intrusive body. The mineralization is controlled by two district-scale fault zones and is especially intensive in the area of their intersection, located above and adjacent to the intrusive body. These larger structures host abundant gold-bearing massive and drusy quartz and chalcedony veins, zones of intense stockwork and strong brecciation, as well as numerous mineralized felsic dykes.

The gold grades within the mineralized structures are commonly in the range of 200 ppb to 2.0-3.0 g/t Au, with higher (up to 16 g/t Au) values attributed to the fault intersection area. Multi-staged gold mineralization found in the quartz veins, stockwork and altered dykes is associated with sulphide minerals (mainly pyrite and arsenopyrite) and elevated As, Bi and Ag values. A later mineralizing episode produced sulphide mineral-bearing chalcedony and drusy quartz veins, with gold concentrations accompanied by elevated Sb, Hg, Ag and Pb values, indicating the affinity of epithermal style gold mineralization.

The property is considered to represent a bulk-tonnage exploration target, with potential of the structures to host a major gold deposit. During the 2002 exploration program, the prospect has been advanced to a drill-ready stage.

## RÉSUMÉ

La propriété de Cynthia couvre une grande zone (plus de 2x2 km) de minéralisation aurifère associée à une intrusion de monzonite quartzique de la Suite de Tombstone du Crétacé. La minéralisation est contrôlée par deux zones faillées à l'échelle du district et elle est particulièrement riche dans la zone de leur intersection au-dessus et près de l'intrusion. Ces vastes structures recèlent des essaims de filons de quartz et de calcédoine aurifères massifs et drusiques, des stockworks et des zones intensément bréchifiées ainsi que de nombreux dykes felsiques minéralisés.

Les teneurs en or dans les structures minéralisées varient de 200 ppb à 2,0-3,0 g/t Au, les teneurs les plus élevées (jusqu'à 16 g/t Au) attribuées à la zone faillée de l'intersection. Plusieurs étapes de minéralisation en or dans les filons de quartz, les stockworks et les dykes altérés est associée à des sulfures (principalement pyrite et arsénopyrite) et des teneurs élevées en As, Bi et Ag. Un épisode de minéralisation tardif a produit des filons de calcédoine et de quartz drusique sulfurés ainsi que des concentrations d'or accompagnées de valeurs élevées de Sb, Hg, Ag et Pb, ce qui indique une affinité avec une minéralisation d'or de style épithermal.

La propriété pourrait représenter une vaste cible d'exploration, les structures offrant le potentiel de loger un important gisement d'or. Les travaux d'exploration de 2002 ont permis de préparer la zone d'intérêt jusqu'au stage des forages.

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## INTRODUCTION

The Cynthia property is 100% owned by Klad Enterprises Ltd. The property is centred at 63°23.5' north latitude, 131°21' west longitude on NTS map sheet 105O/6. It consists of 50 contiguous Yukon mining claims covering 1045.5 hectares (2582 acres).

The property is situated within the Tintina Gold Belt, 160 km north of the village of Ross River, Yukon and 80 km north of the Sheldon Lake airstrip along the North Canal Road (Fig. 1). A winter road extending from the Canal Road west to the Plata airstrip is located roughly 10 km south of the property.

## PROPERTY EXPLORATION HISTORY

The Cynthia property was first staked as the Art 1-12 claims in 1967 by the Hess Project (Atlas EL, Quebec Cartier Mining Company, and Phillips Brothers (Canada) Ltd.). In 1968, the companies performed grid soil sampling, and magnetic and electromagnetic surveys (Yukon MINFILE, 2001).

The eastern part of the project site was restaked as the Emmy 1-16 claims in 1981 by Union Carbide Canada Ltd., which conducted geological mapping and rock sampling in 1981 and 1982 (James, 1982). The program located weakly pyritic to arsenopyritic quartz veins that returned values up to 3130 g/t Au, 775 g/t Ag, 795 g/t Sb and 1.7% Pb. Breccia zones returned values up to 660 ppb Au;

a black chert breccia returned 3.7% Pb and 948 g/t Ag (Union Carbide, 1982, in-house report).

The property was restaked in 1991 as the Hess 1-64 claims by Noranda Exploration Company Ltd. In 1995, the entire present property area was staked as the EM 1-112 claims by Brian Lueck, who optioned the property to Yukon Gold Corporation, which conducted geological mapping, and rock and soil sampling. This program defined three anomalous areas, including one hosted by brecciated argillite between two prominent quartz monzonite intrusive bodies (Lueck, 1996). In 1997, Cyprus Canada Inc. optioned the claims and performed a helicopter reconnaissance program. Cyprus Canada sampled the hornfelsed metasedimentary rocks between the two intrusive bodies, obtaining values from 0.5 to 1.0 g/t Au; a sample of quartz-feldspar dyke material returned 1.8 g/t Au (Yukon MINFILE, 2001). In 2002, shortly after the EM 1-112 claims lapsed, Klad Enterprises Ltd. staked the present Cynthia 1-50 claims.

## REGIONAL GEOLOGY

The Cynthia property is located within the Tintina Gold Belt (British Columbia and Yukon Chamber of Mines, 2000), which occurs along a trend of mid- to Late Cretaceous granitoid (diorite, granodiorite, quartz monzonite, syenite) intrusions extending from central Alaska, across central Yukon, to the Yukon-British Columbia border, roughly parallel to the ancient

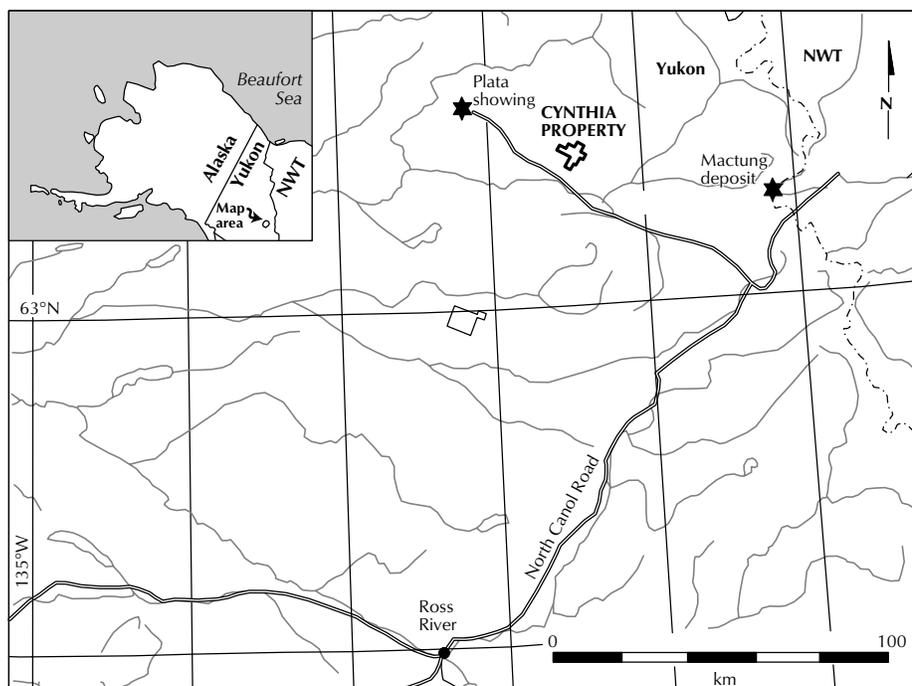


Figure 1. Location of Cynthia property.

North America craton boundary. In Yukon, the belt is superimposed on the Selwyn Basin, a thick sequence of shelf and off-shelf continental margin metasedimentary rocks formed from late Precambrian to Triassic time (Gordey and Anderson, 1993).

The southeastern portion of the Selwyn Basin, including the Cynthia property, is underlain by a broad package of Ordovician to Devonian Road River Group and Devonian-Mississippian Earn Group sedimentary rocks, with west-northwest-trending upper Precambrian to Lower Cambrian Hyland Group sedimentary units occurring to the southwest. Hyland Group sedimentary rocks consist largely of coarse clastic 'grits', shale, and lesser limestone and calcareous clastic rocks. Road River Group sedimentary rocks consist mostly of thick chert horizons with lesser interbedded shale, limestone and calcareous mudstone, with minor mafic volcanic units. Earn Group

sedimentary rocks consist of chert-pebble conglomerate and greywacke, as well as lesser shale and sandstone.

The area is transected by a number of variably striking faults and fault zones that represent portions (branches) of regional-scale lineaments. Most prominent among them are west-northwest and north-northeast-trending faults that control the majority of larger intrusive stocks, dykes and zones of mineralization, both in regional and local scales.

### PROPERTY GEOLOGY

The Cynthia property is situated between and adjacent to two mid-sized (5 by 3 km and 3 by 2 km) exposures of quartz monzonite belonging to the Cretaceous Tombstone Intrusive Suite (Fig. 2). These have been

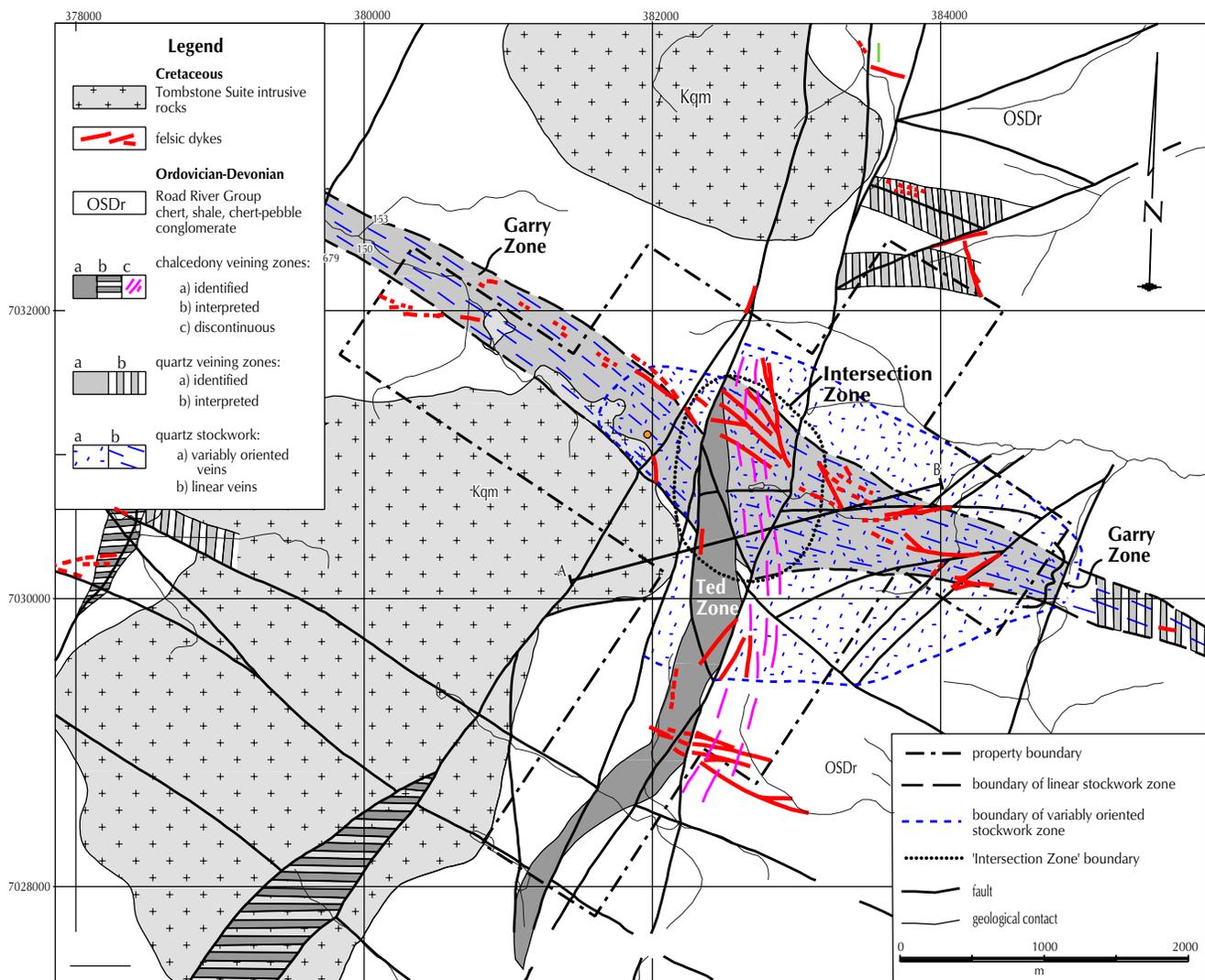


Figure 2. Geology map of Cynthia property and vicinity.

interpreted as surface exposures of a single large pluton. The larger southern exposure is coarse-grained and equigranular, whereas the northern one is K-feldspar-porphyrific, possibly suggesting a shallower emplacement depth. Small apophyses of the southern intrusive body occur along its northern contact. Numerous quartz and quartz-feldspar porphyritic dykes are found along structural corridors across the property, but are especially concentrated in the central, western and extreme southern parts of the property.

Sedimentary rock on the property consists primarily of Ordovician-Devonian Road River Group chert and interbedded shale, with minor limestone in the northern part of the property and extending farther northward. Devono-Mississippian Earn Group chert-pebble conglomerate has been identified in the centre of the property but the contacts remain undetermined. Previous mapping has identified the entire sedimentary package as Road River Group; however, local greywacke and limestone units in the southern part of the property suggest at least the partial presence of Earn Group sedimentary rocks.

A broad district-scale fault zone incorporating several north-northeast-trending faults occurs across the central property area where it is superimposed on a large arcuate band of silicified limestone. This unit varies from a maximum thickness of roughly 500 m in the central region to a minimum of 100 m in extreme southern portions. The faults, interpreted as steeply east-dipping reverse faults, have caused lateral and vertical stratigraphic displacement, resulting in downward displacement of stratigraphy along the western side. The fault zone hosts several quartz-feldspar porphyry dykes and numerous chalcedony and drusy quartz veins, as well as intensive quartz stockwork. It bears significant gold mineralization, and has been delineated as the Ted Zone (Fig. 2). North-south-trending chalcedony veins also occur east of the Ted Zone.

Another wide (0.5-1.0 km) district-scale fault zone strikes west-northwest through the property centre, parallel to regional-scale strike-slip faulting of the Tintina fault system. This zone hosts numerous dyke swarms, suggesting it represents a continuous dilational corridor. The zone also hosts intensive quartz stockwork and thicker linear veins, with minor chalcedony veining. Within the stockwork zone, quartz veins and stringers strike predominantly east-southeast, and dip steeply to the south-southwest, although a significant number strike roughly north-south, dipping steeply westward. Vein

densities range from 5 to 10 veins per metre, with locally much higher concentrations. Veins are generally centimetre- to millimetre-scale, although veins up to 30 cm wide are present locally. This broad fault zone also bears significant gold mineralization and has been delineated as the Garry Zone (Fig. 2).

The intersection of the Ted Zone and Garry Zone occurs in the central part of the property. This 1.5 by 1.5 km intersection area is characterized by the most intensive fracturing and brecciation, the highest quartz vein density, and the strongest silicification and hydrothermal alteration on the property. This area also hosts the most intensive gold mineralization, and has been delineated as the Intersection Zone (Fig. 2).

## ALTERATION

Metasedimentary rocks adjacent to the intrusive rocks have been intensely hornfelsed, with pyrite and pyrrhotite development, and are strongly gossanous for several hundred metres outbound from the intrusive contacts.

Multiple episodes of quartz-dominated mineral assemblage formation occurred through hydrothermal processes related to the intrusive activity. At least three major episodes of silicification have occurred:

1. An event or sequence of events of pervasive replacement-style (within limestone) and fracture-controlled (in the form of intensive stockwork) silicification;
2. A subsequent episode of chalcedony formation along fractures and open spaces, and;
3. A later episode of drusy to cockscomb quartz formation.

All three episodes have occurred intensely within the Ted Zone limestone horizon in the central part of the property; intensive silica replacement suggests the limestone was the most reactive and easily replaced unit. Quartz veining is most intensive within the Garry Zone, forming stockwork locally, and indicating mineral formation occurred mainly as fracture-filling veins within less reactive rocks.

Late quartz-porphyrific and quartz-feldspar-porphyrific dykes display silicification and late-stage quartz veining, indicating dyke emplacement preceded early silicification. Locally, the dykes have been brecciated, cemented by quartz, then re-brecciated and recemented by chalcedony and/or drusy quartz. Argillic alteration is common both

within dykes and metasedimentary rocks. Sericitization, as part of the quartz-sericite-iron carbonate-pyrite assemblage, is most pronounced within dykes.

## MINERALIZED ZONES

Auriferous mineralization occurs primarily within broad fault zones delineated above as the Ted, Garry and Intersection zones (Figs. 2, 3). The intensity of the mineralization and sets of mineral assemblages depend on local structural settings, host rock lithology and style of hydrothermal alteration. The geochemical signatures of mineral assemblages most typical for each zone are summarized in Table 1.

### TED ZONE

The Ted Zone hosts abundant north-northeast-striking, steeply east-dipping chalcedony veins superimposed on the wide unit of strongly pervasive silicified limestone and subordinate quartz stockwork. To the east, the Ted Zone grades into the area of discontinuous chalcedony and less pervasive silicification.

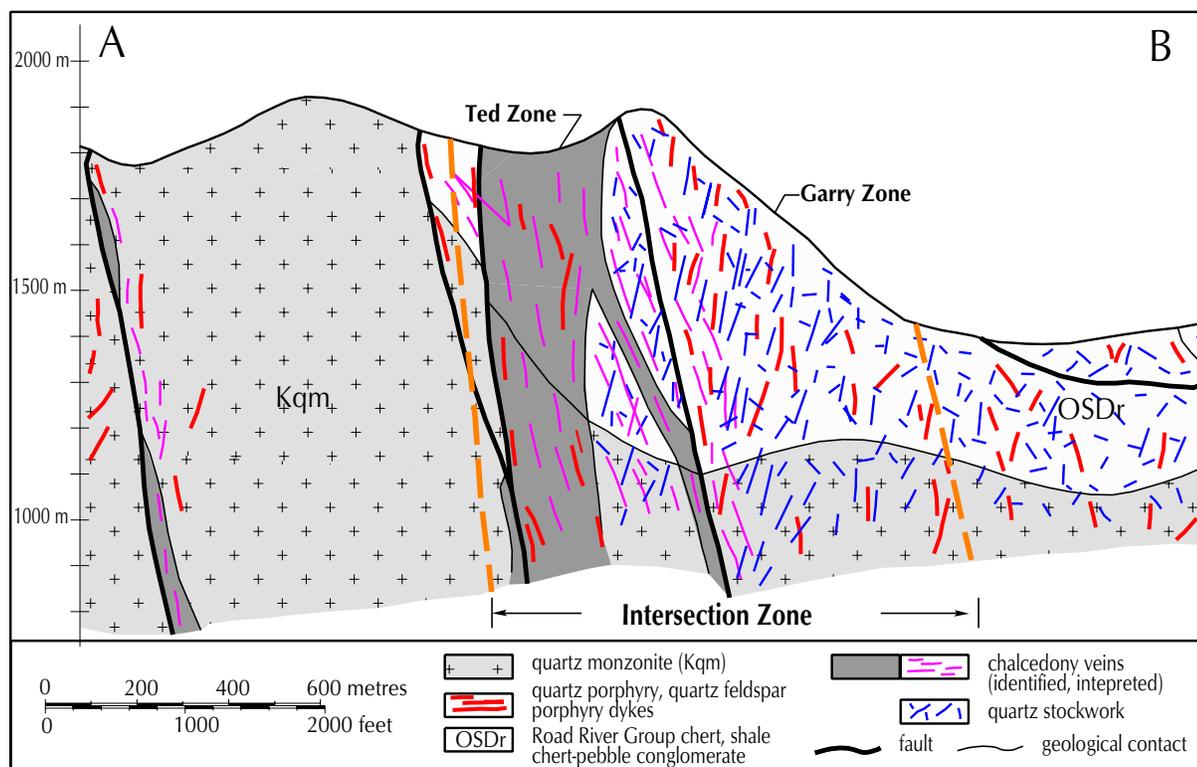
Rock sampling along the northern 2.0-km portion of the Ted Zone returned strongly anomalous gold values along the entire sampled length. Gold values range from background levels to a high of 2.56 g/t Au. The higher

grades are attributed to the chalcedony veins and north-northeast-trending altered dykes. Typically lower, but also anomalous (within 200-400 ppb Au range), numbers are related to the quartz-dominated assemblages of the quartz stockwork.

To the south, rock chip sampling of the chalcedonic and pervasively silicified material returned values up to 1.24 g/t Au over 0.9 m and 1.125 g/t Au over 1.1 m. Composite grab sampling returned values up to 2.54 g/t Au. Further south, the Ted Zone narrows somewhat; however, sampling of abundant chalcedonic float and rubblecrop returned values in the 150-500 ppb Au range to a maximum of 944 ppb Au.

Roughly 2 km south of the sampled area, several grab samples were taken in a broad unit of silicified fine clastic sedimentary rocks with local chalcedony veining, interpreted to be an extension of the Ted Zone. Although most returned background gold values, several were weakly anomalous, with one returning a value of 349 ppb Au. This suggests the Ted Zone has a minimum extent of 4.0 km, and remains open to the south.

To the north of the main sampled zone, systematic chip sampling returned low values, although composite grab samples returned values up to 310 ppb Au. However, 2 km further north along the strike of the Ted Zone,



**Figure 3.** Hypothetical section: line A-B (see Figure 2), Cynthia property, looking north.

PROPERTY DESCRIPTIONS

**Table 1.** Representative rock sample assay results for various auriferous assemblages in the Ted, Garry and Intersection zones<sup>1</sup>.

Sample	Au (ppb)	Ag (ppm)	As (ppm)	Bi (ppm)	Cu (ppm)	Pb (ppm)	Sb (ppm)	Zn (ppm)
<b>Ted Zone, gold-arsenic assemblage</b>								
C1021	1125	5.5	2730	<2	40	7	79	2
C1022	1240	4.6	3920	<2	62	7	98	5
CY4126	944	3.8	780	<2	31	9	69	25
CY4249	2560	2.2	>10 000	32	67	17	137	38
C4048	490	11.6	1060	<2	41	4	41	5
C1018	2540	4.4	8290	<2	410	11	198	9
<b>Ted Zone, gold-quartz assemblage</b>								
CY4251	349	0.2	232	<2	24	2	6	27
<b>Garry Zone, gold-quartz assemblage</b>								
C4081	930	12.9	240	<2	9	9	44	2
CY4114	888	2.6	345	<2	4	5	81	5
C4014	380	1.2	369	<2	10	4	171	<2
CY4105	658	2.1	367	<2	13	5	255	2
<b>Intersection Zone, gold-arsenic assemblage</b>								
C4078	3200	25.4	>10 000	39	90	48	73	10
C4079	711	9.8	>10 000	5	51	36	32	27
CY4003	1965	2.5	>10 000	<2	46	11	60	5
CY4142	16 000	22.3	>10 000	114	140	21	201	8
<b>Intersection Zone, gold-quartz assemblage</b>								
CY4138	890	3.5	341	<2	15	7	68	43
CY4140	1010	10.2	580	<2	4	13	94	3
CY4155	406	3.6	538	<2	58	6	27	14
C4080	534	1.4	963	<2	6	10	43	2
C1011	430	6.4	724	<2	6	14	60	8
<b>Intersection Zone, gold-silver-lead-antimony-arsenic assemblage</b>								
C1004	2650	376	>10 000	386	161	3100	2590	28
C3001	440	59.8	>10 000	44	44	1220	860	134
C4058	590	85.0	9040	145	32	580	518	34
C3005	2500	328	3070	618	29	836	614	6
C4004	555	114	>10 000	167	206	1475	1525	16
C4005	3250	246	7320	420	140	323	176	6
C4010	3190	63.0	>10 000	136	294	119	102	24
C4057	4650	479	>10 000	780	209	6720	5480	17

<sup>1</sup>Assays were performed in ALS Chemex labs of North Vancouver, B.C. All rock samples were pulverized until 85% of fragments were less than 75 microns in size; then an evenly mixed 30 g portion was analysed for 34-element aqua regia ICP-AES, as well as gold by fire assay with atomic absorption finish. «Overlimits» of Ag, Pb, Sb, Cu were reanalysed to provide respective elemental contents.

samples of altered dyke material returned values up to 2.56 g/t Au.

The most pronounced geochemical signature of Ted Zone auriferous mineral assemblages is the strong enrichment in arsenic as arsenopyrite (Table 1). Pyrite is also widespread; however, the importance of other sulphide minerals is negligible. Sample CY4251, taken from the southern end of the 4-km-long sampled interval of the Ted Zone, returned a low arsenic value. This low-sulphide quartz stockwork mineralization, rather than a highly arsenical sulphide-rich assemblage, is more typical for the flanks of the mineralized zone.

**GARRY ZONE**

The Garry Zone occurs as a kilometre-wide zone extending west-northwest across the property. The zone hosts intensive quartz stockwork with a dominant west-northwest orientation of thicker quartz veins, and minor chalcedony veins; central portions also host dyke swarms. This central portion also incorporates and is surrounded by an area of variably oriented thin quartz veins forming a stockwork zone 2.0-2.5 km in width. The density of veinlets within this stockwork varies from 5 to 10 per m,

with local concentrations of up to 20 veinlets per metre. These are generally centimetre- to millimetre-scale in thickness. The stockwork is superimposed on dykes, indicating post-intrusive formation.

Gold values typical of the Garry Zone, commonly in the range of 300-900 ppb Au, are somewhat lower than those of the Ted Zone. The Garry Zone extends at least 2 km east-southeast of the Ted Zone, and for 3 km to the west-northwest. Sampling of the dyke swarm along the southeast property boundary (Fig. 2) returned values up to 296 ppb Au, although most samples returned low anomalous values. To the west-northwest, the Garry Zone returned less consistent and generally lower gold values, although anomalous results up to 679 ppb Au were also obtained 3 km west-northwest of the intersection with the Ted Zone.

The Garry Zone quartz stockwork bears low-sulphide auriferous mineralization associated with minor fine-grained pyrite and trace arsenopyrite (Table 1). Notably, these gold grades are associated with low arsenic values, even where the quartz veins are superimposed on dykes (e.g., sample CY4114). On the other hand, some highly altered dykes bearing abundant arsenopyrite contain only

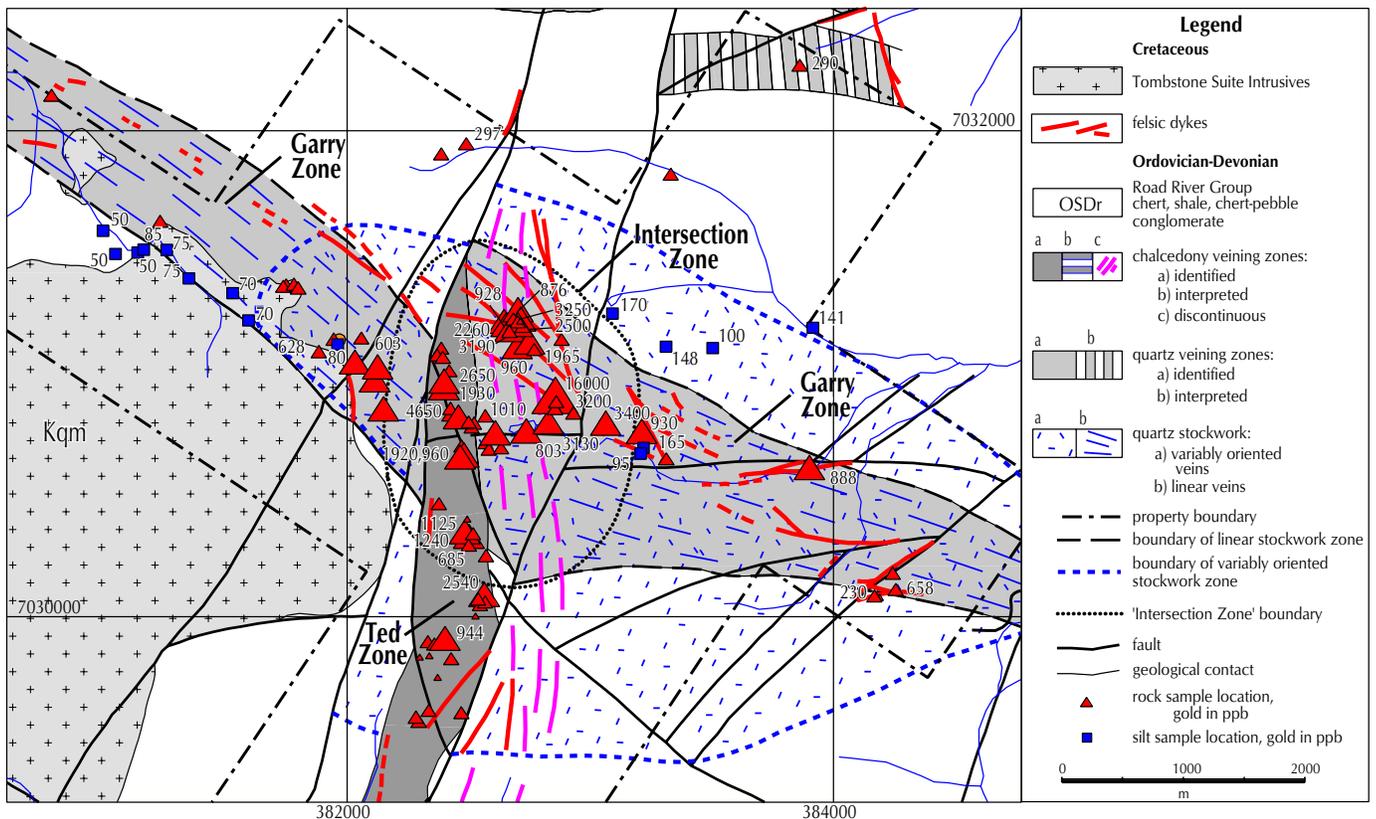
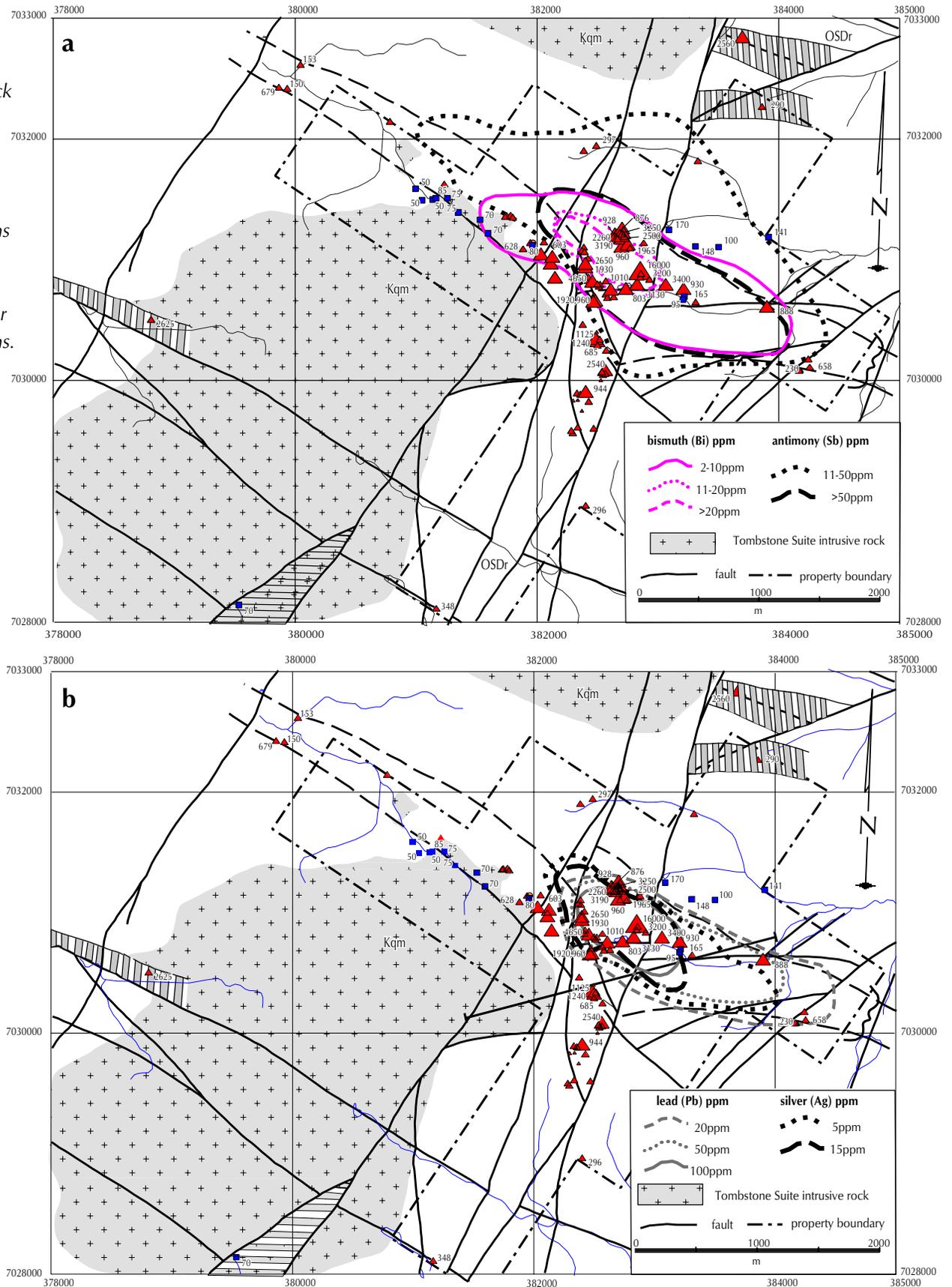


Figure 4. Sample locations with anomalous gold values (in ppb).

**Figure 5.**  
 Geochemical contour plots  
 (based on rock sampling):  
**(a)** showing  
 bismuth and  
 antimony concentrations  
 and  
**(b)** showing  
 lead and silver concentrations.



low gold values. Thus, in contrast to the Ted Zone where auriferous mineralization is associated mainly with arsenopyrite, with only minor importance of gold in quartz stockwork, in the Garry Zone the vast majority of gold is found in the low sulphide quartz stockwork, and only a minor fraction is related to altered dykes and stocks containing arsenopyrite.

## INTERSECTION ZONE

The Intersection Zone is a conditionally contoured, circular area, outlined to incorporate the zone of mutual intersection and influence of the Ted and Garry zones (Fig. 2). As a result, all mineralized occurrences, veins, stockwork and dykes found within the Intersection Zone can be attributed either to the Ted Zone or to the Garry Zone (Fig. 3). These occurrences, however, exhibit characteristics that differ from those found within the Ted and Garry zones outside the Intersection Zone.

The most pronounced feature of the Intersection Zone is the greater abundance of mineralized veins and dykes, and a much higher density of quartz stockwork compared with the outlying Ted and Garry zones. This is not surprising, due to the much higher degree of structural preparation within this zone of intersecting district-scale faults. The location of the Intersection Zone, close to or just above the 'saddle' between the two intrusive exposures (probably surface expressions of a single continuous intrusion extending under the 'saddle'), has strongly influenced the strength of thermal preparation and hydrothermal activity.

As a result, the second most pronounced, and most important feature of the Intersection Zone is that it hosts the most intense gold mineralization found on the property (Fig. 4). Gold grades are commonly in the 1.0-4.0 g/t Au range; one sample returned 16.0 g/t Au. Notably, both styles (highly arsenical and low-sulphide) of auriferous mineralization within the Intersection Zone bear higher gold grades than respective assemblages in the outlying Ted and Garry zones (Table 1). In particular, the gold-arsenic assemblage in the Intersection Zone returned values typically up to 3.20 g/t Au, and includes the sample returning 16.0 g/t Au. Similarly, the low-sulphide quartz stockwork assemblage within the Intersection Zone returned numerous values exceeding 1.0 g/t Au.

The third major feature of the Intersection Zone is the existence of a broadly occurring third gold-bearing mineral assemblage absent from the outlying Ted and Garry zones. This is a highly sulphidized, highly arsenical gold-rich assemblage, also bearing very high bismuth (up to 780 ppm Bi), antimony (up to 6720 g/t Sb; Fig. 5a), silver (up to 479 g/t Ag) and lead (up to 3100 ppm Pb; Fig. 5b) values (Table 1). This set of elements associated with gold indicates an epithermal affinity of this mineral assemblage.

The structural settings of the fault-controlled mineralized zones forming the Intersection Zone, particularly the steep eastward dip of the Ted Zone and southward dip of the Garry Zone, suggest a southeast plunge of the Intersection Zone.

## CONCLUSIONS

The Cynthia property represents a large and very prospective target with potential to host significant bulk-tonnage gold mineralization. This is defined by

1. The presence of the large (1.5 by 1.5 km) Intersection Zone mineralized structure formed at the intersection of two district-scale faults; this structural setting is typical of large gold deposits. In particular, this occurs at the largest known Tintina Gold Belt deposit, the Donlin Creek deposit, hosting a resource exceeding 780 million g (25 million ounces) gold, with a similar lateral extent of mineralization;
2. The location of the mineralized structure within and adjacent to the 'saddle' area between the two intrusive exposures, thus increasing the intensity of thermal preparation, and channeling the hydrothermal activity related to the magmatic process;
3. The presence of consistent gold mineralization within mineralized structures, with the potential for local high 'bonanza-type' gold concentrations; and
4. The occurrence and superposition of several stages of gold mineralization, including the later stages of epithermal affinity.

During the 2002 field season, the property has been advanced to a drill-ready stage. A diamond-drilling program proposed for 2003 is designed to test areas of higher gold concentration within the Intersection Zone.

## ACKNOWLEDGEMENTS

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