

Rossland  
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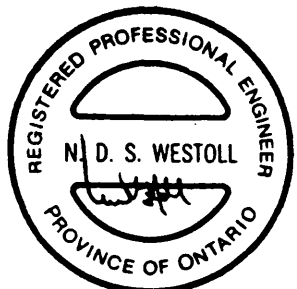
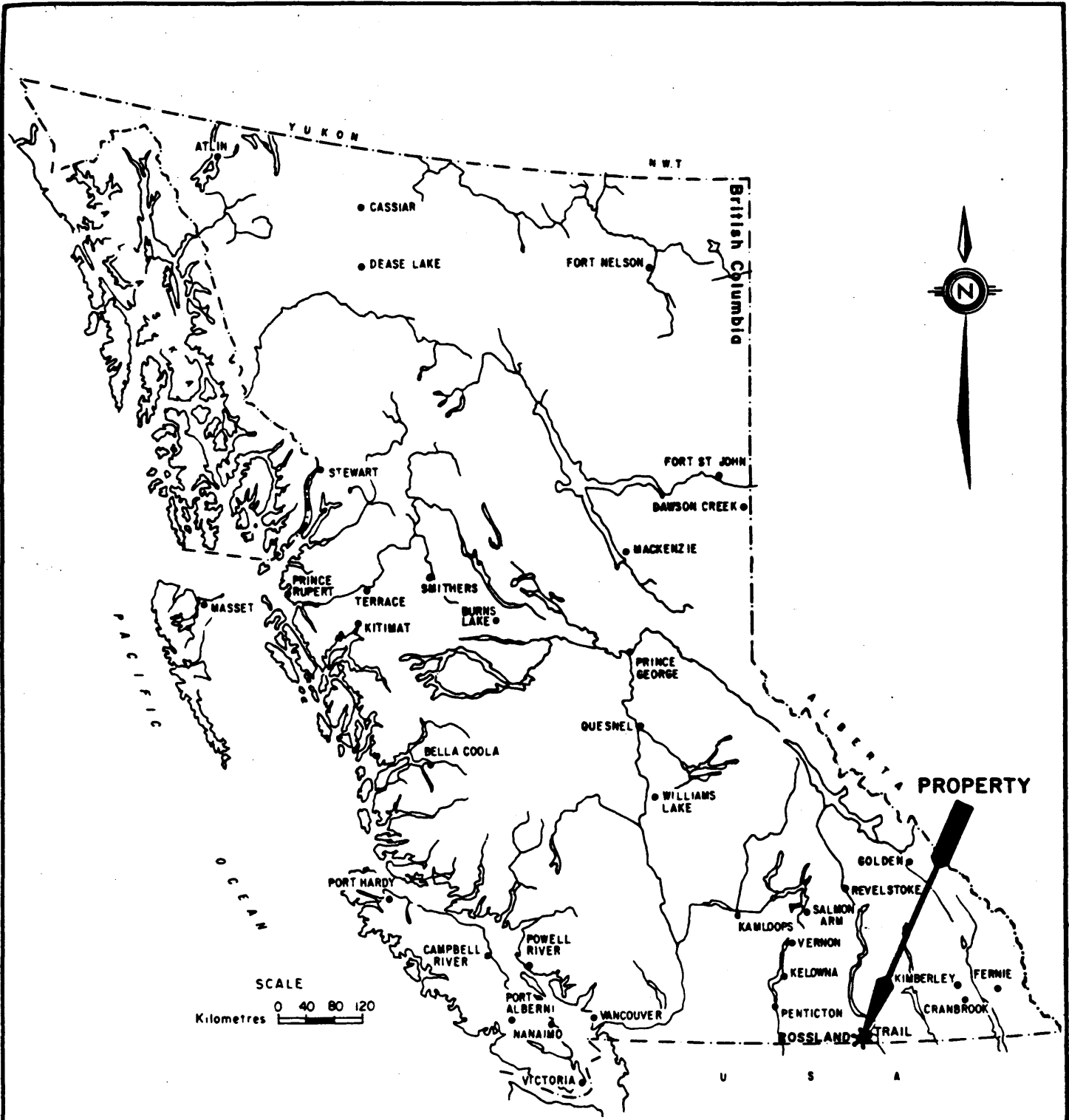
**INTRODUCTION**

Neil D.S. Westoll & Associates Ltd. (Westoll & Associates) was requested by Antelope Resources Limited (Antelope) to review the exploration work carried out to date on the Rossland property of Bryndon Ventures Inc. (Bryndon) in British Columbia and to comment on both the surface and depth potential of the property to host economic deposits of gold mineralization. Antelope holds an option on the 45 claim property from Bryndon under which it must expend \$150,000 in exploration work in the first year and a total of \$500,000 over a 2-1/2 year period to acquire a 50% interest.

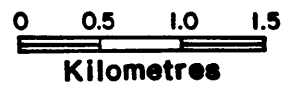
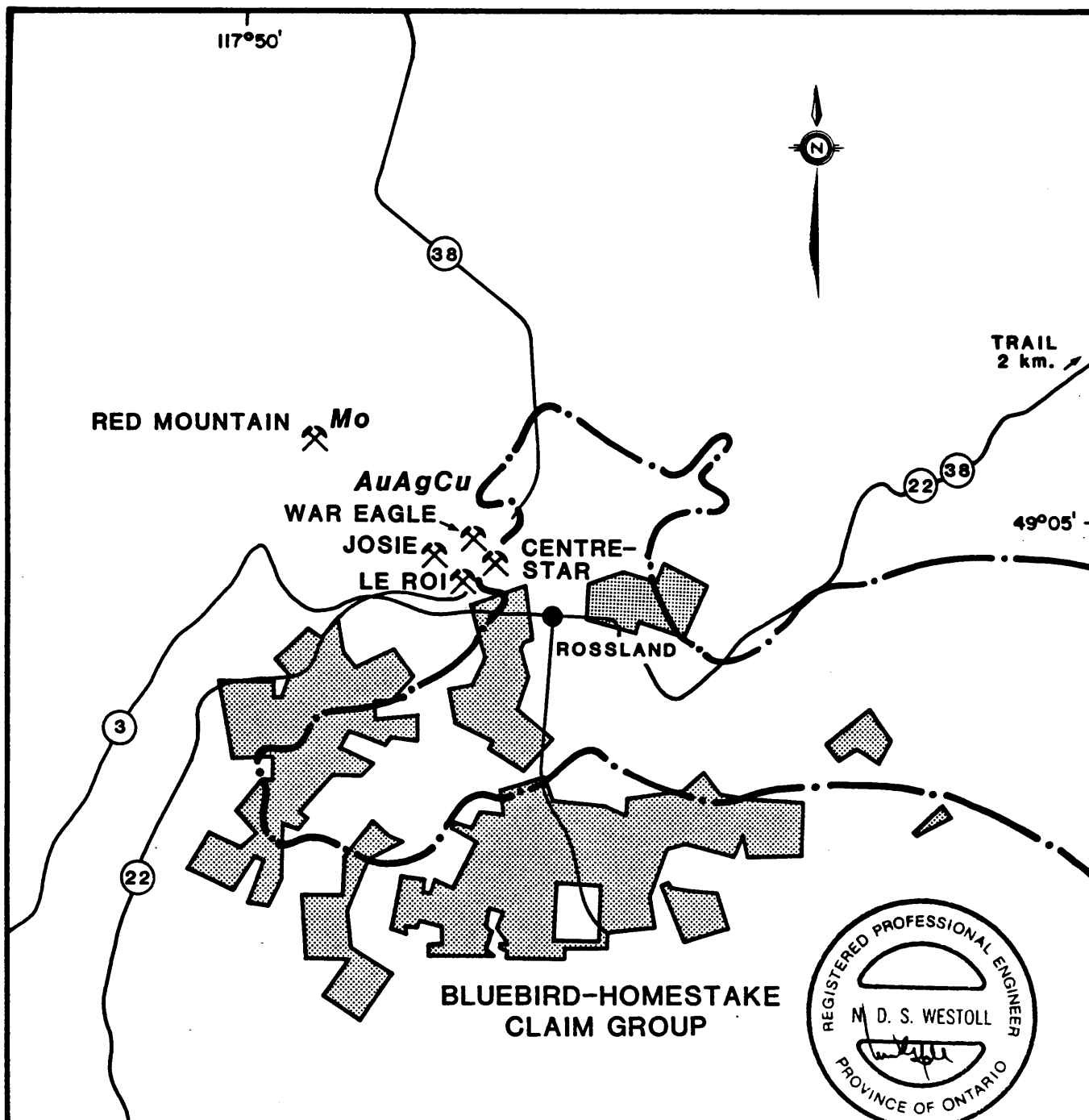
The property was visited by Dr. Westoll on June 16, 1987 with principals and consultants of Antelope and Bryndon. No independent sampling or check assaying was carried out by Westoll but drill core from previous drilling at the Bluebird was examined. No single summary report of previous work on the property was available from Antelope or Bryndon. Westoll sub-contracted various portions of the necessary data gathering to three separate individuals. Property geology reports and available literature on the regional geology and gold deposits of the area were reviewed by Robert Jackson of Robert G. Jackson & Associates and the geophysical reports were reviewed by John Boniwell of Excalibur International Consultants Ltd., both of whom are independent consultants. Boniwell visited the property on July 27 and 28, 1987. Because of his extensive experience in the area, Robert Yorke-Hardy of Y-H Technical Services Ltd. prepared the regional and property compilation maps. Yorke-Hardy is a Director of Antelope, and his data presentations were checked by Westoll and Jackson. This report is derived from these sources of information and was prepared by Westoll and Jackson.

#### **LOCATION AND ACCESS**




The property is located in southeastern British Columbia approximately 7 kilometres north of the United States border at latitude  $49^{\circ} 4' N$ /longitude  $117^{\circ} 48' W$  (Figure 1). It lies immediately south of, and partially within, the city limits of Rossland, which is located approximately 6 kilometres southwest of Trail, B.C. (Figure 2) and is served by major provincial highways. The nearest commercial airport is at Castlegar, some 30 km to the north. Access to the majority of the property is by way of paved roads within Rossland and a combination of gravel and 4-wheel drive roads elsewhere.



ANTELOPE RESOURCES LIMITED		
ROSSLAND PROPERTY TRAIL CREEK MINING DIVISION, B. C.		
<b>PROPERTY LOCATION MAP</b> PROVINCE OF BRITISH COLUMBIA		
Neil D. S. Westoll & Associates Ltd.		
Date: July, 1987	Scale: 1:8,000,000	Figure No. 1



**LEGEND**

-  Rossland Monzonite
-  Major Past Producer
-  Antelope Resources Properties
-  Roads

<b>Antelope Resources Limited</b>		
<b>ROSSLAND PROPERTY</b>		
TRAIL CREEK MINING DIVISION, B.C.		
<b>PROPERTY LOCATION MAP</b>		
<b>Neil D.S. Westoll &amp; Associates Ltd.</b>		
DATE: JULY 1987	SCALE: 1:46,690	FIGURE: <u>2</u>

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**PROPERTY DESCRIPTION**

The property consists of 56 claims assembled in eight contiguous groups (Figure 3). Of these, 45 are Crown granted mineral claims under option from Bryndon by an agreement dated June 3, 1987. The remaining 11 claims were staked by Antelope. The claims, covering a total of 1349.57 acres (546.15 hectares), are listed in Table I. Ground inspection of several of the claims staked by Antelope (Antelope fractions 3, 4, 6 and 7) was undertaken by Westoll.

Relief on the Bluebird-Homestake claim group is approximately 1200 feet (365 m) with moderate grades allowing for bulldozer access. The portals of the Mayflower and Bluebird workings are between 2800 and 3000 feet (850-915 m) above sea level. The property is snow covered for about four months of the year.

The area has been affected by continental glaciation. Two ice directions have been recorded with the final advance being south to southwest. A thin but relatively pervasive till cover exists on the Bluebird-Homestake claim group and till thickness is generally in the order of 3 to 8 metres. Consequently, outcrop is limited.

Table 1 (continued)

List of Claims Optioned or Held

<u>Claims Staked by Antelope</u>	<u>Record No.</u>	<u>Area</u>	
Antelope # 1 Fr.	1001	16.30 ha	40.28 ac
Antelope # 2 Fr.	1002	8.97	22.17
Antelope # 3 Fr.	1003	1.12	2.77
Antelope # 4 Fr.	1004	1.47	3.63
Antelope # 5 Fr.	1005	0.11	0.27
Antelope # 6 Fr.	1006	0.26	0.64
Antelope # 7 Fr.	1007	2.88	7.12
Antelope # 8 Fr.	1016	0.53	1.31
Bender # 1 Fr.	1017	6.35	15.69
Bender # 2 Fr.	1018	1.86	4.60
		<u>39.85 ha</u>	<u>98.48 ac</u>

Reverted Crown Grant picked up by Antelope

Jumbo No. 3 Fr.	L. 3030 (Record No. 1000)	0.97 ha	2.40 ac
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TOTAL AREA 546.15 ha 1349.57 ac

## **EXPLORATION HISTORY**

The history of the discovery and development of mineral deposits in the Rossland area is described by Drysdale (1915) and summarized by Gilbert (1948) and Little (1982). The exploration and development history of the Antelope properties, in particular the Bluebird-Mayflower claim group, is described in detail by Sampson (1986). The following is an historical summary based on these sources.

### **Regional History**

- 1887 to 1889 - Discovery of Au and Ag on the Lily May claim by Oliver Bordeau and Newlin Hoover. This claim, originally staked in the 1860's, was the first claim in the district.
  
- 1890 - Discovery of Au and Cu on the Le Roi, Centre Star and War Eagle claims by Bourgeois and Morris.
  
- 1891 - First ore shipment from the Le Roi Mine.
  
- 1894 to 1928 - Increase in annual production of Le Roi and other mines from 1,800 tons to a peak of 360,000 tons in 1903.
  - Average annual production of 286,000 tons between 1903 and 1917.
  - Decline in production after 1917 and eventual closure of the main mines (Le Roi, Centre Star and War Eagle) in 1928.

- 1937 to 1941 - An additional 137,000 tons mined by leasers.
- 1901 to 1941 - Intermittent production of Au and Cu at the Velvet Mine (8 km southwest of Rossland).
- 1966 to 1972 - Molybdenum production on the Coxey claim by Red Mountain Mines Ltd.
- 1981 - Airborne magnetic and electromagnetic survey of the area by Apex Airborne Surveys Ltd.

#### **Property History**

- 1889 to 1938 - Claims staked and worked by a number of different owners: Mayflower (1889), Homestake (1890), Bluebird (1900).
  - Limited underground development and production (535 tons).
- 1947 - Major portion of the present land package assembled by Rossland Mines Ltd.
- 1948 to 1956 - Exploration and underground development work leading to calculation of ore reserves and a mill feasibility study.
  - Production of 1,077 tons of ore from the Bluebird-Mayflower zone.
- 1962 to 1967 - Ground electromagnetic, magnetometer, potentiometer and soil surveys of selected claims under various



option agreements, including Noranda Inc. and Northwood Mining Ltd.

- 1972 to 1980 - Ross Island Mining Co. Ltd. (previously Rossland Mines Ltd.) leased the Bluebird-Homestake area claims to Standonray Mines who produced 6,450 tons of ore from the Bluebird zone.
- 1981 to 1986 - Bryndon Ventures Ltd. (previously Ross Island Mining Co. Ltd.) commissioned C. Sampson to compile development and production reports and update ore reserve calculations.
- Bryndon established 16 km of grid on the Bluebird-Homestake group of claims and carried out a VLF electromagnetic survey.
  - 530 metres of trenching and 631 metres of diamond drilling on the Homestake-Gopher, Bluebird-Mayflower, and North shear zones carried out by Bryndon.

**Table 4****Summary of 1985/86 Drill Results from the North Zone**

<u>Drill Hole</u>	<u>Depth</u> m	<u>Width</u> m	<u>Au</u> oz/ton	<u>Ag</u> oz/ton
85-1	8.99 - 9.59 28.56 - 29.56	0.60 1.00	0.369 0.531	0.50 0.53
85-2	46.26 - 46.76 52.37 - 54.37	0.50 2.00	0.223 0.664	0.30 0.91
85-3	51.51 - 51.81	0.30	0.131	0.12
85-4	33.22 - 33.53 38.10 - 38.71 53.95 - 54.25	0.31 0.61 0.30	0.133 0.259 0.120	1.11 0.41 0.30
86-6	6.40 - 7.01	0.61	0.326	0.13
86-7	10.36 - 10.97	0.61	0.646	0.88

## REGIONAL GEOLOGY AND GOLD DEPOSITS

### Regional Geology

The rocks of the Rossland area (Figure 4) consist of Carboniferous siltstone, argillaceous quartzite and slate of the Mount Roberts Formation, which are unconformably overlain by Lower Jurassic volcanic flows, agglomerates, and tuffs of the Rossland Formation (Little, 1982). Contemporaneous with the volcanism were intrusions of augite porphyry sills and, southwest of Rossland, an ultramafic body. The volcanic sequence has a regional north-south trend with dips usually to the west.

These rocks have been intruded by the Rossland monzonite and Nelson plutonic suite of Upper Jurassic age. These intrusions are closely associated with the ore deposits of the area. The Rossland monzonite is an east-west trending elongated stock which plunges north to northwest. The Nelson granodiorite and diorite intrusions, which outcrop to the northeast of Rossland, are believed to underlie the area of the known ore deposits (Le Roi-Centre Star). Numerous diorite and lamprophyre dikes related to this intrusion cut the country rock and the Rossland monzonite.

During the Tertiary period, the Coryell alkaline syenite, Sheppard granite, and associated dikes intruded the area. These appear to be post-mineralization.

Major structural features in the area are poorly evident due to the lack of outcrop. Based on underground and geophysical information, there appear to be two main fracture directions: an east-west set of shears dipping north and a north-south set of faults dipping steeply east. The latter are frequently occupied by dikes and some-

times offset the east-west shears. In addition to these recurrent structures, a north-south trending thrust fault has been identified by Little (1982) west of Rossland (Figure 4).

### **Gold Deposits**

The Rossland gold camp produced approximately 6.2 million tons of ore with a recovered grade of 0.47 oz/ton Au, 0.6 oz/ton Ag, and 1% Cu (Gilbert, 1948). Ninety-eight percent of the production came from four adjacent properties (Le Roi, Centre Star, War Eagle, Josie) located on the northwest contact of the Rossland monzonite, northwest of Rossland (Figure 2). These four properties were collectively known as the Le Roi Mine and acquisition and operation of them by Consolidated Mining and Smelting (now Cominco) in the early part of this Century was a major factor in the initial growth of that company. The Velvet Mine, located 8 km southwest of Rossland, also produced a significant tonnage of Au-Cu ore. Approximately another fifty small mines within the camp, including the Homestake, Maid of Erin and Lily May, produced up to 100,000 tons of ore (Little, 1960).

The orebodies in the centre of the camp consist of replacements along east-west fissures developed in augite porphyry and Rossland monzonite. The ore varies from disseminated to narrow stringers to massive sulphides. The sulphides are chiefly pyrrhotite and chalcopyrite, with only minor amounts of other sulphides. The gangue consists of altered wall rock with variable amounts of quartz and calcite.

The gold occurs in solid solution or ex-solution within chalcopyrite (Thorpe, 1967). The Au:Ag ratio of the ore averages 0.78. There is a trend toward a decrease in chalcopyrite content toward the monzonite contact coupled with an increase in the Au:Ag

ratio. Within the Le Roi Mine, a similar trend is observed from the upper to lower portions of the ore body.

Veins in the Rosslund camp generally strike E-W to N60-70°E (Le Roi - Centre Star) but there exists a less frequently observed strike of N60°W (War Eagle). Dips are 60-80°N. Although the veins may be continuously mineralized over distances of several hundreds of metres, the ore bodies generally occur as a series of shoots 2-30 metres in width, 60-120 metres in strike length, and in excess of 300 metres in plunge length. Overall depth exceeded 480 metres in the Le Roi Mine.

A number of factors appear to be important in the localization of these ore shoots and these are:

1. proximity to the Rosslund monzonite contact;
2. development of shears along the contacts of various intrusive dikes or tongues;
3. intersection between N-S structures and E-W shear zones;
4. intrusion of lamprophyre and diorite dikes in N-S structures which influenced thickening of ore;
5. wall rock reaction with intrusive dikes and tongues;
6. intensity of fracturing.

The Rosslund camp consists of a small productive area about 2000 by 4000 feet (600-1200 m) in lateral dimensions, by 1600 feet (480 m) in depth, surrounded by a much larger area of occurrences and low

tonnage deposits (Gilbert, 1948). This larger area corresponds to the western part of the Rossland monzonite stock and the country rock immediately adjacent. Mineralization of significance occurs primarily in the augite porphyry and volcanic country rocks. Mineralization within sediments of the Mount Roberts Formation tends to be weakly disseminated rather than occurring as definite veins. Within the Rossland monzonite, the shear zones are distinct and tight. Except close to the monzonite/volcanic contact, only small amounts of gold and associated metals have been discovered. However, it should be emphasized that many of these smaller deposits have only been explored to shallow depths.

#### **Mineral Zonation in the Rossland Camp**

The character of the numerous small deposits and occurrences of the area appear to vary in a more or less systematic way with respect to mineralogy, gold to silver ratio, alteration, and mode of occurrence. These variations likely reflect differences in the physical and chemical conditions that existed during ore deposition both laterally and vertically, and are typical of epithermal vein deposits.

We have attempted to establish the zonation pattern related to the main ore deposits of the Rossland Camp to try to provide a means of estimating the depth potential of near surface deposits. A preliminary review of occurrence descriptions (Drysdale, 1915) and a mineral zonation study of the Rossland area (Thorpe, 1967) suggests that the occurrences can be assigned to seven groups based on various similarities (Table 2).

The spatial distribution of these deposit groups is given in Figure 4. The Group 1 deposits have accounted for the bulk of

TABLE 2

Classification of Mineral Assemblages in the Rosland Camp

	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>	<u>Group 5</u>	<u>Group 6</u>	<u>Group 7</u>
<b>MINERALOGY</b>	PYRRHOTITE CHALCOPYRITE pyrite sphalerite molybdenite arsenopyrite native silver	GALENA SPHALERITE TETRAHEDRITE BOULANGERITE pyrrhotite pyrite arsenopyrite native bismuth chalcopryrite magnetite	SPHALERITE NATIVE BISMUTH BISMUTHINITE pyrrhotite chalcopryrite pyrite arsenopyrite scheelite	MAGNETITE pyrrhotite chalcopryrite pyrite arsenopyrite	NATIVE BISMUTH BISMUTHINITE pyrrhotite pyrite chalcopryrite arsenopyrite cobaltite scheelite	MOLYBDENITE native bismuth bismuthinite pyrrhotite chalcopryrite pyrite arsenopyrite magnetite cobaltite scheelite	NATIVE GOLD pyrrhotite chalcopryrite pyrite galena sphalerite
<b>GOLD ASSOCIATION</b>	CHALCOPYRITE	TETRAHEDRITE boulangerite	?	?	?	?	NATIVE GOLD
<b>Au:Ag RATIO</b>	HIGH	LOW	?	?	?	?	HIGH
<b>MODE OF OCCURRENCE</b>	MASSIVE SULPHIDE REPLACEMENT	dissemination and narrow veinlet replacements	dissemination and narrow veinlet replacements	dissemination and narrow veinlet replacements	dissemination and narrow veinlet replacements	dissemination and narrow veinlet	QUARTZ VEINS
<b>ALTERATION</b>	Silicification biotite/sericite	chlorite	?	?	?	?	?
<b>STRUCTURAL CONTROL</b>	east-west	east-west	east-west	east-west	east-west	NORTH-SOUTH	east-west
<b>HOST LITHOLOGY</b>	VOLCANICS monzonite	VOLCANICS	SEDIMENTS volcanics	MONZONITE volcanics	VOLCANICS monzonite	SEDIMENTS	SERPENTINITE

production in the Rossland Camp and occur on the NW margin of the Rossland monzonite where structural conditions at this level of erosion appear to be most favourable. They are characterized by a pyrrhotite-chalcopyrite mineral assemblage and a relatively high Au:Ag ratio.

The Group 2 deposits appear to form an isolated group on the southern margin of the monzonite. They are characterized by the appearance of tetrahedrite in place of chalcopyrite, the occurrence of lead, zinc and antimony sulphides, and the dominance of silver over gold (low Au:Ag ratio). These deposits are found in close association with Group 1 type occurrences (North Vein, Crown Point). In epithermal vein systems the lead-zinc-silver mineral assemblages generally occur vertically above the copper-gold assemblages. It is therefore possible that the Group 2 deposits represent a vertical zonation assemblage above a Group 1 vein deposit. Further analysis of data from the Rossland Camp is required to test this hypothesis.

To the west of the Le Roi-Centre Star area, Group 3 deposits occur in a linear belt roughly parallel to the monzonite contact. They are characterized by the presence of sphalerite and bismuth minerals in the sulphide assemblage. These occurrences are further evidence of a lateral mineral zonation away from the Rossland monzonite contact.

The Group 4 and 5 deposits occur along the remaining margins of the Rossland monzonite. Group 4 deposits, characterized by the presence of magnetite, are predominantly within the Rossland monzonite. The Group 5 deposits, characterized by bismuth minerals which formed late in the mineralizing sequence in response to lower temperature conditions (Thorpe, 1967), occur primarily in the volcanics and sediments. These assemblages could be considered a more distal environment around a centre of heat or fluid flow.



The Group 6 deposits, including the Red Mountain molybdenum mine, form a linear belt related to the major north-south regional structural trend and a series of granodiorite intrusions. The deposition of molybdenite preceded that of the Au, Ag and Cu ore minerals. This feature is likely an early one on top of which the signature of the Group 5 deposits has been overprinted. The Group 7' deposits in the OK Mountain area differ significantly from the other group deposits in their mineralogy, mode of occurrence, and host lithology. Their relationship to the other Rossland deposits is not clear.

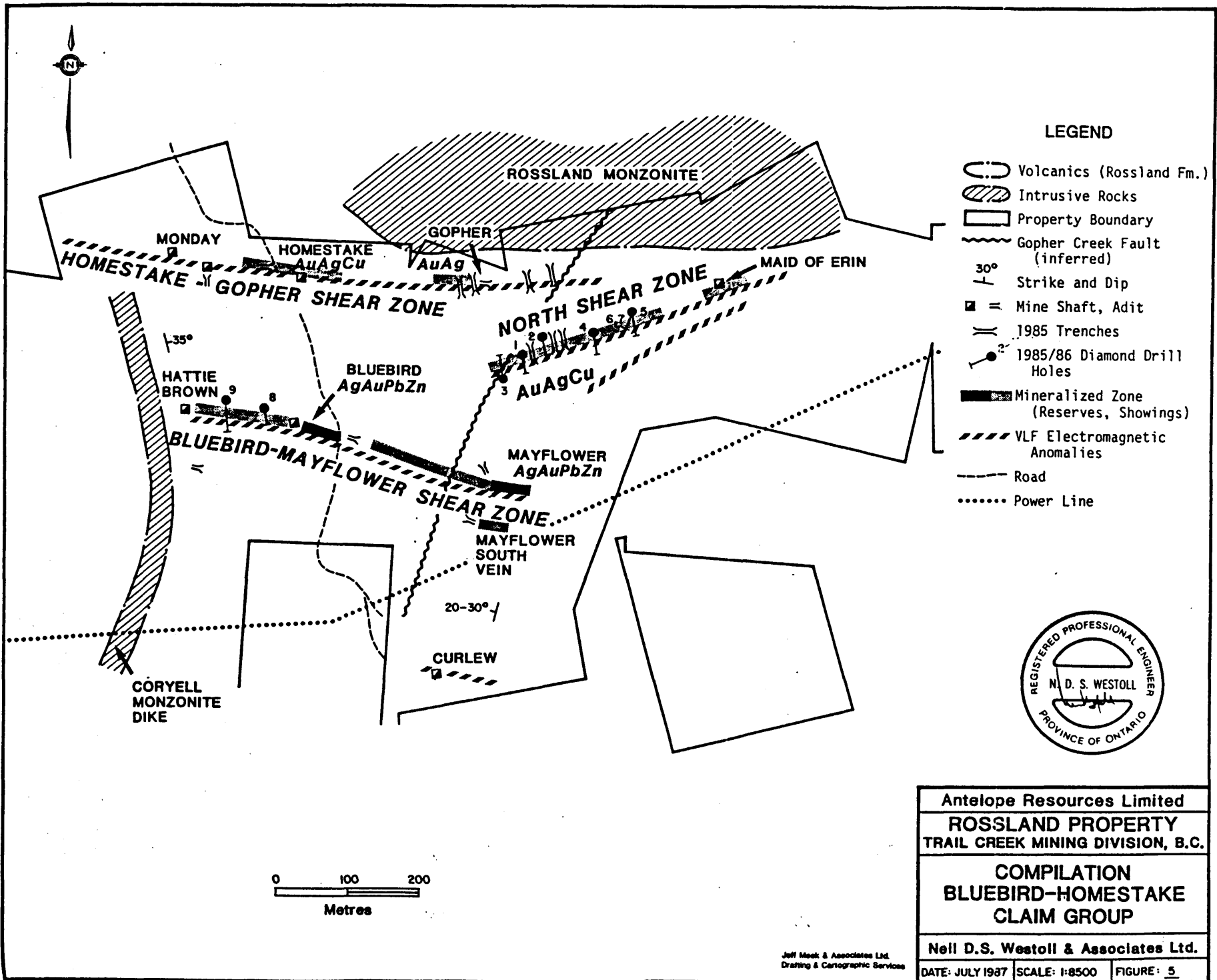
## PROPERTY GEOLOGY AND MINERALIZATION

### Geology

The properties of Antelope are located along the southern margin of the Rosslund monzonite which intrudes NE trending andesitic volcanics of the Rosslund Formation (Figure 4). Since the main area of current interest is the Bluebird-Homestake claim group, a discussion of the property geology will focus on this area. The geology of this claim group is summarized from reports by Sampson (1984, 1986) and Skerl (1964). Limited level plans and sections were available for the old workings. Level plans from the more recent mining operations of Standonray Mines should exist, but were not available for examination.

The shear zones in this area are hosted by porphyritic and non-porphyritic augite andesite of the Rosslund Formation (Figure 5). Locally they contain cherty tuffaceous interbeds. On the northern boundary of the claims, the Rosslund monzonite forms an east-west contact with the volcanics. The volcanics have also been intruded by diorite porphyry and lamprophyre dikes along NE-SW fault structures. These are believed to be related to the intrusion of the Nelson batholith and are an important factor in the localization of ore shoots in the Rosslund Camp. A monzonite porphyry dike striking N-S and dipping 35°E intrudes the volcanics and intersects the Bluebird-Mayflower vein west of the Hattie Brown shaft. This intrusion is believed to be related to the Coryell intrusions (Skerl, 1964) and would therefore post-date the mineralization.

The volcanic rocks predominantly strike N-NE and dip 20-30°NW. Locally they have been metamorphosed or altered by the emplacement of intrusions so they now appear to grade into rocks of dioritic texture. Similarly the siliceous sediments have been metamorphosed to



Antelope Resources Limited  
 ROSSLAND PROPERTY  
 TRAIL CREEK MINING DIVISION, B.C.

**COMPILATION  
 BLUEBIRD-HOMESTAKE  
 CLAIM GROUP**

Neil D.S. Westoll & Associates Ltd.  
 DATE: JULY 1987 SCALE: 1:8500 FIGURE: 5

Jeff Meek & Associates Ltd.  
 Drafting & Cartographic Services

banded hornfels as part of a contact aureole around the Rossland monzonite.

East-west shear structures transect the property and dip moderately to steeply northward. These shears are intersected by N-NE and NW trending fault structures commonly occupied by diorite porphyry and lamprophyre dikes. Horizontal displacements along these structures may be up to 50 feet (15 m). Intersections of the E-W and NE-SW structures have been favourable loci for gold deposits in the Rossland Camp.

### **Mineralization**

In general, gold and silver on the property are contained in sulphides which have replaced the augite andesite along east-west shear zones. The concentration of sulphides varies from disseminations to narrow stringers to massive sulphides up to 22 feet (6.7 m) wide. The most abundant sulphides are pyrrhotite and pyrite with accessory sphalerite, galena, arsenopyrite, tetrahedrite, chalcopyrite, and boulangerite (a Pb-Sb sulphide - occasionally Ag bearing). Three mineralized shear zones have been recognized on the Bluebird-Homestake claim group.

#### **1. Bluebird-Mayflower Shear Zone**

This structure accounts for most of the past production and the only delineated reserves on the property. The structure strikes N50-60°W, dips 50-65°NE, and is traceable for about 600 metres. Past production and reserve estimates are given in Table 3.

The Bluebird zone consists of a series of lens disrupted by numerous cross-faults and dikes. The iron sulphides are accompanied by

Table 3

Past Production and Reserve Estimates  
for the Bluebird and Mayflower Zones

	<u>Tons</u>	<u>Au</u> oz/ton	<u>Ag</u> oz/ton	<u>Pb</u> %	<u>Zn</u> %
<u>Bluebird Section</u>					
1908 - 1913 production	439	0.32	45.0	5.6	-
1951 production	207	Gross value \$42.00 per ton			
1972 - 1977 production	<u>6,450</u>	0.050	14.02	2.07	2.82
	7,096				
Reserve Estimates	28,150	0.07	13.0	2.9	4.3
<u>Mayflower Section</u>					
1900 production	96	0.16	9.5	2.0	3.7
1949 production	<u>870</u>	0.12	12.5	2.9	5.6
	966				
Reserve Estimates	18,000	0.13	3.7	1.5	3.4

sphalerite, galena, tetrahedrite, arsenopyrite, and boulangerite. The Au:Ag ratio for the mineralization is low being approximately 0.0054. The ore bodies have shown a tendency to pinch and swell. Underground development and drilling have tested the zone to a depth of 360 feet (110 m) at which level the structure and mineralization appear to be present.

The Mayflower zone, located 280 metres east of the Bluebird zone on the same structure, is similar in most respects to the Bluebird zone but differs in its higher Au:Ag ratio of approximately 0.035. Exploration has been carried out to a depth of 200 feet (60 m) at which level the mineralization is still present. A second parallel vein structure, the Mayflower South Vein, is located 80 metres south of the Mayflower zone.

Limited drilling between the Bluebird and Mayflower zones to a depth of 150 feet (45 m) has confirmed continuity of the mineralized structure but grades have been low. At the western extent of the shear zone near the Hattie Brown shaft, the structure encounters a 40-foot wide monzonite porphyry dike. Both surface work and underground drilling suggest the structure continues west of the dike and is mineralized. Limited work has been done in this area.

## 2. Homestake-Gopher Shear Zone

This structure has been explored extensively on the Homestake claim down to the 300 foot (90 m) level by underground development. However, limited work has been done on the eastern extension of the shear in the area of the Gopher adit. The structure strikes N80°W, dips 70°N, and is traceable for about 650 metres. A limited amount of ore was extracted from the Homestake workings in the early 1900's. This graded 0.04 oz/ton Au, 2.8 oz/ton Ag, and 0.3% Cu. Chip samples

across one metre widths in a trench west of the Gopher adit obtained values of 0.244-0.302 oz/ton Au and 0.36-0.88 oz/ton Ag (Sampson, 1986).

### 3. North (New) Shear Zone

This structure is located between the Homestake-Gopher and Bluebird-Mayflower shear zones. It strikes approximately N70°E, dips either vertically or shallowly to the southeast, and is traceable for 400 metres. Chip samples across 1 metre intervals in four of six trenches across the structure returned values averaging 0.355 oz/ton Au and 0.97 oz/ton Ag (Sampson, 1986). Six diamond drill holes tested this area in 1985/86. The best intersection consisted of 2 metres grading 0.664 oz/ton Au and 0.91 oz/ton Ag. The results are summarized in Table 4.

The mineralization consists of pyrrhotite, chalcopyrite, arsenopyrite, pyrite and sulphosalts. It varies from disseminations and veinlets in the volcanics to massive sulphide sections up to a metre wide. The sulphides are usually accompanied by silicification. The high Au:Ag ratio of 0.39 is typical of Group 1 occurrences.

The shear zone appears to be cut off to the west by the Gopher Creek fault. Two hundred metres to the northeast, sphalerite appears as part of the mineral assemblage. The structure is continuous to the northeast as far as the Maid of Erin occurrence and possibly beyond.

#### **Geophysical Response to Mineralization**

The geophysical response to the known mineralized veins on the Bluebird-Mayflower claim group has been reviewed by John Boniwell

of Excalibur International Consultants Ltd. This review was based on data from an airborne electromagnetic and magnetometer survey (Sheldrake, 1981) and a ground VLF and horizontal loop electromagnetic survey (Mark, 1986). Boniwell's summary report on the applicability of various geophysical methods to the property is presented in Appendix I.

In summary, the shear structures hosting the sulphide mineralization on the property are readily detectable and traceable by the VLF electromagnetic method. Although the VLF coverage of the property is incomplete, at least two additional east-west shear structures appear to be present, one immediately southeast of the North shear structure and the other coincident with the Curlew workings (Figure 5). Interpretation of the VLF data also suggests that a NE-SW fault exists along Gopher Creek. Marginal to this fault, the Au:Ag ratio of the mineralization appears to be higher than portions of the vein structures more distant from the fault.

The VLF data offers little information with regard to the quantity or nature of sulphides along the mineralized structures. A test line of horizontal loop electromagnetics, a method more specific to sulphides, yielded a response at high frequencies to the Gopher occurrence but not to the North vein. In addition, the airborne EM survey failed to detect any of the veins from a flight altitude of 40 metres. Given that the mineralization occurs primarily as disseminations and narrow veinlets with only local pockets of massive sulphides, it is likely that I.P. (Induced Polarization) methods may be more effective in reflecting the sulphide content of the vein structures near surface.

The aeromagnetic data are of mediocre quality owing to difficulties maintaining consistent flight altitude, but lithological



contrasts do exist. A ground magnetic survey would clearly assist in identifying fault structures and dikes which have played an important role in the localization of the mineralization.

Considerable potential exists for identifying drill targets at depth using geophysical methods. A carefully controlled aeromagnetic survey could possibly assist in tracing the contact of the Rossland monzonite to depth. Additionally, drill targets at depths below 150 metres should be identifiable using such methods as large loop broad band electromagnetics, gradient array I.P., and down-hole pulse EM.

## EXPLORATION POTENTIAL

A number of observations lend support to interpretation of the mineralization on the Bluebird-Homestake claim group as the vertical expression of a gold-bearing chalcopyrite-pyrrhotite system similar to that in the Le Roi-Centre Star area. These are as follows:

1. gold-bearing chalcopyrite-pyrrhotite mineralization (North Vein) occurs along a shear structure oriented in a similar direction to the Le Roi-Centre Star structure and is similarly associated to the Rosslund monzonite contact;
2. the above mineralization is closely associated with a unique mineral assemblage within the Rosslund Camp, that being tetrahedrite-galena-sphalerite-boulangerite in the Bluebird-Mayflower zones; in epithermal vein systems, lead-zinc-silver mineral assemblages generally occur vertically above copper-gold assemblages;
3. in the Rosslund Camp the structural intensity and the number of occurrences in the Bluebird-Homestake area appear to be second only to the Le Roi-Centre Star area;
4. a major north-south fault inferred to exist east of the Centre Star Mine projects south toward the Bluebird-Homestake claims and may in fact correspond to the structure along which a Coryell monzonite dike has been intruded at the west end of the Bluebird-Mayflower shear zone; this crossing structure may be fundamentally important in localizing ore in the Rosslund Camp.

Exploration on the Homestake mineralization has been limited to about 90 metres below surface. Only minor ore has been extracted from this area due to generally low metal values. Further to the east in a trench along the same structure, mineralization grading 0.244-0.302 oz/ton Au has been observed. This portion of the structure has not been explored in detail.

Exploration on the Bluebird mineralization has been carried out to a depth of at least 110 metres. The ore bodies have been characteristically lenticular with a tendency to pinch and swell with depth. There is no indication that the mineralization terminates at the depth of current workings. However, the low Au:Ag ratio of these sulphides partly results in a low metal value. Should the Au:Ag ratio increase with depth, the economics of this zone could change dramatically. There are also indications that the shear zone and mineralization extend to the west of the Coryell monzonite dike. That area was not adequately tested by the VLF survey.

Exploration on the Mayflower mineralization has been to a depth of about 60 metres. Although the Au:Ag ratio of this mineralization is higher than the Bluebird sulphides, the total metal value is somewhat less. A higher Au:Ag ratio seems to be characteristic of mineralization close to the Gopher Creek fault which lies between the Bluebird and Mayflower zones. This area has been tested with only a few diamond drill holes to a depth of about 45 metres.

The discovery of economic grades of gold over mineable widths on the North shear zone is relatively recent in the history of the property. This reaffirms the potential of finding important new mineralization close to old established workings. Further drilling is warranted to fill in between holes 3 and 4 and to test for depth extensions. Although the mineralization appears to weaken to the

northeast, the entire length of the North shear zone should be tested at 50 metre intervals.

In addition to the near surface and depth potential of the known mineralization, potential exists for the discovery of new mineralization elsewhere on the property. At least two additional shear zones appear to be present, based on incomplete VLF coverage. The large majority of lands held by Antelope have not been explored by modern methods.

## CONCLUSIONS

It is the opinion of Westoll & Associates, based on an evaluation of the regional setting and available work reports, that the Rossland properties held by Antelope have potential, both near surface and at depth, to host gold mineralization similar to that mined in the Le Roi-Centre Star area of the Rossland Camp.

The Le Roi-Centre Star gold-silver-copper deposits are characterized by pyrrhotite-chalcopyrite replacements along east-west shear structures developed in volcanics of the Rossland Formation close to the contact with the Rossland monzonite intrusion. Four properties in an area 600 metres by 1200 metres have produced approximately 6.2 million tons of ore from depths as great as 480 metres with a recovered grade of 0.47 oz/ton Au, 0.6 oz/ton Ag and 1% Cu.

The Bluebird-Homestake claim group exhibits a number of geological features similar to that of the Le Roi-Centre Star area. These include:

1. close proximity to the margin of the Rossland monzonite;
2. volcanic host lithologies of the Rossland Formation;
3. intensity of shearing and frequency of occurrences;
4. sulphide mineralization developed along east-west shear structures;
5. presence of intersecting north-south fault structures, often healed with diorite porphyry and lamprophyre dikes, which in

the Le Roi Mine area were important in localizing mineralization;

6. presence of a gold-bearing chalcopyrite-pyrrhotite mineral assemblage.

The unusual mineral assemblage of tetrahedrite-galena-sphalerite-boulangerite which characterizes the Bluebird-Mayflower shear zone could represent a vertical zonation above a chalcopyrite-pyrrhotite system.

The discovery of gold in the North shear zone at economic grades over mineable widths is a relatively recent development in the history of the property. Further work is required to define the strike length, plunge, and depth extent of this mineralization.

The Bluebird-Mayflower shear zone itself hosts Ag-Au-Pb-Zn mineralization. Portions of this structure have been explored by diamond drilling and underground development to depths varying from 45 metres to 110 metres. As there is no indication that the mineralization terminates at these depths, further potential exists here.

The Homestake-Gopher shear zone has been explored to a depth of 90 metres in the area of the Homestake workings but has received limited attention elsewhere. A trench close to the Gopher adit revealed significant values of Au over a one metre width. Diamond drilling is warranted in this area.

A combined approach of VLF electromagnetic and ground magnetometer surveys would appear to be the most effective means of identifying and tracing shear zones on the property while providing some information on important cross structures, either NE-SW trending

faults or dikes occupying these faults. Further geophysical test work is required to assess the relative effectiveness of I.P. and other electromagnetic methods to detect concentrations of sulphides and thus assist in the selection of drill targets. Most of the lands held by Antelope have not been explored by modern methods.

**RECOMMENDED EXPLORATION PROGRAMME AND BUDGET**

A two-stage exploration programme totalling \$540,000 is recommended for Antelope's Rossland properties.

**Phase I**

Phase I is designed to:

1. determine the strike length, dip, plunge, and depth continuity of gold mineralization in the North shear structure by means of fill-in diamond drill holes and a second tier of holes to test the structure at a vertical depth of about 90 metres;
2. explore the central and eastern portions of the Bluebird-Homestake claim group for other shear zones or extensions of existing shear zones by means of a detailed VLF electromagnetic survey; and attempt to identify important north-south structures or dikes by means of a magnetometer survey;
3. evaluate the effectiveness of I.P. to screen various portions of shear zones with respect to sulphide content and thus assist in drill target selection;
4. begin a preliminary programme of geological mapping and surface sampling to evaluate the new claims acquired in the Rossland area;
5. compile geological data on the Le Roi-Centre Star deposits to establish the target size of the individual ore bodies and document any zonation trends within them; similarly compile



data on the Bluebird zone based on the Standonray mining records, if they exist.

The estimated Phase I budget is as follows:

A. Bluebird-Homestake Claim Group	
Linecutting: 39 km - 50 m line spacing (\$500/km)	\$ 19,500
VLF survey: 36.7 km (\$150/km)	5,505
Magnetic Survey: 39 km (\$165/km)	6,435
I.P. test surveys: 10 days (\$1,500/day)	15,000
Diamond drilling and assaying: 550 metres (\$80/m)	44,000
Miscellaneous surface sampling	5,000
Supervision, compilation and reports	<u>40,000</u>
	135,440
Contingencies - 10%	<u>13,550</u>
Sub-total Phase I-A	148,990
	say \$150,000
B. Recently Acquired Claims	
Geological mapping and surface sampling	<u>\$ 10,000</u>
TOTAL - Phase I	<u>\$160,000</u>

## Phase II

The elements of the Phase II programme will be determined, in part by the results of Phase I. The objectives of Phase II would be to:

1. assess, by additional diamond drilling, the following existing targets:

- Gopher adit area
  - Bluebird-Mayflower depth extensions
  - North Shear Zone (contingent on Phase I results)
2. develop drill targets along VLF conductors by means of geophysical techniques (I.P.) and trenching;
  3. test some of the VLF conductors by diamond drilling;
  4. extend the VLF and magnetic surveys to other land holdings in the Rossland area to evaluate their mineral potential;

The estimated Phase II budget is as follows:

Linecutting: 20 km (\$500/km)	\$ 10,000
VLF-EM and magnetic surveys: 20 km (\$300/km)	6,000
I.P. survey: 10 days \$1,500/day)	15,000
Trenching: 1000 m	7,500
Geological mapping and surface sampling	15,000
Diamond drilling	
and assaying: 2500 m (\$80/m)	200,000
Supervision and reports	<u>60,000</u>
	313,500
Contingency - 20%	<u>62,700</u>
TOTAL - Phase II	\$376,200
	say <u>\$380,000</u>

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**APPENDIX I**

**Geophysics in the Rossland, B.C., Mineral Environment,**

**by J.B. Boniwell**

**Excalibur International Consultants**