GEOLOGICAL ASSESSMENT REPORT

RUDDOCK CREEK CLAIM GROUP

(IF, IN, TO, IT CLAIMS)

RUDDOCK CREEK PROPERTY

KAMLOOPS - REVELSTOKE MINING DIVISIONS

NTS 082 M / 15

LAT. 51 47' 18" ; LONG. 118 51' 50"

U.T.M. ZONE 09
655245 E.
5548634 N.
N.A.D. 27 DATUM

DATE STARTED: AUGUST 17th, 2000
DATE COMPLETED: SEPTEMBER 4th, 2000
OWNER/OPERATOR: DOUBLESTAR RESOURCES Ltd.
AUTHOR: Peter Lewis, and Paul D. Gray
SUBMITTED: February 19, 2001

TABLE OF CONTENTS

Page

1.0 INTRODUCTION
1.1 INTRODUCTION..........1

2.0 LOCATION PHYSIOGRAPHY AND ACCESS
2.1 LOCATION PYSIOGRAPHY AND ACCESS..........2

3.0 OWNERSHIP AND MINERAL TENURE
3.1 OWNERSHIP..........4
3.2 MINERAL TENURE..........4

4.0 EXPORATION HISTORY
4.1 HISTORY..........6

5.0 GEOLOGY AND MINERALIZATION
5.1 REGIONAL GEOLOGY..........7
5.2 LOCAL GEOLOGY..........7
5.3 MINERALIZATION..........8

6.0 2000 GRAB/CHIP SAMPLING PROGRAM..........9

7.0 DISCUSSION AND CONCLUSIONS..........10

BIBLIOGRAPHY..........10

LIST OF FIGURES

Page

FIGURE 1 **Location Map, Ruddock Creek Property**......3

FIGURE 2 **Ruddock Creek Mineral Claim Map**......5

FIGURE 3 **Sample Sites and Assay Results**......Back pocket

LIST OF TABLES

Page

TABLE 1 **Ruddock Creek Mineral Claim Tenure Status**....................4

TABLE 2 **Summary of Previous Work**....................6

APPENDECIES

APPENDIX- A Structural Analysis of the Ruddock Creek Zn + Pb Property, SE British Columbia....................A1

APPENDIX- B Statement of Qualifications....................B1

APPENDIX- C Assay Certificates and Chip Sampling Notes....................C1

APPENDIX- D Statement of Expenditures....................D1

1.0 INTRODUCTION

1.1 INTRODUCTION

The Ruddock Creek property is a "Sedex-Type" stratabound zinc-lead deposit which was discovered by Falconbridge Nickel Mines Ltd. and is now owned and operated by Doublestar Resources Ltd. (MINFILE # 08M084).

Doublestar Resources Ltd. conducted a three-week field-mapping program from mid August to early September 2000. The objectives of this program were 1) to evaluate the structural history of the property, 2) determine any structural controls on this stratabound zinc-lead deposit, 3) conduct a property scale inspection, and 4) to geologically map as much of the pertinent exposures as possible.

For this project Doublestar Resources Ltd. contracted Dr. Peter Lewis, PhD. Mr. Lewis prepared a report of his findings and interpretations; and this work will serve as the body of this report. The report "Structural Analysis of the Ruddock Creek Zn + Pb Property, SE British Columbia" is included in its entirety in Appendix A.

2.0 LOCATION PHYSIOGRAPHY AND ACCESS

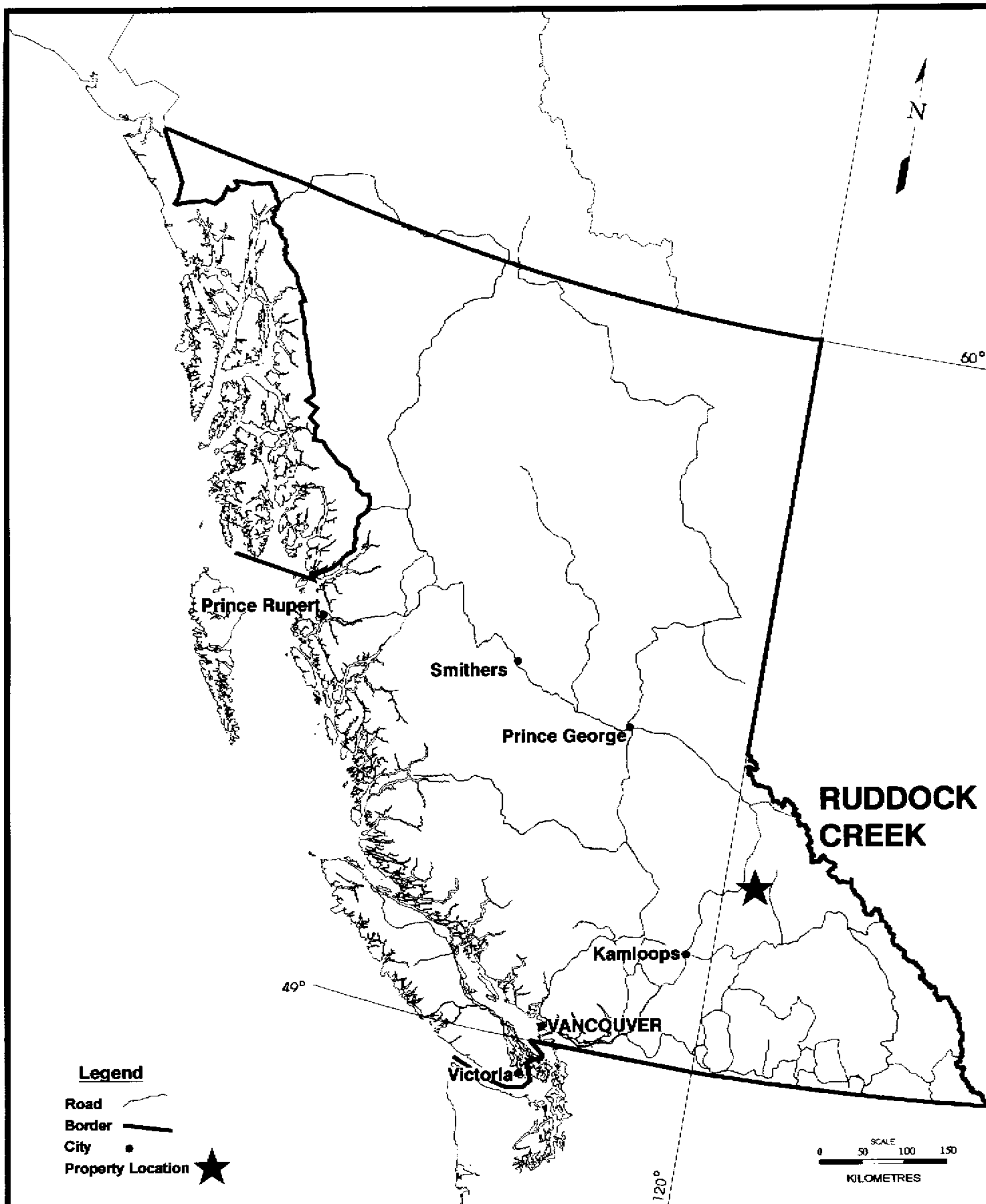
2.1 Location, Physiography, and Access

The Ruddock Creek Property is located 96 kilometres north of Revelstoke, British Columbia in the Monashee Mountains (Figure 1). The property lies on the 082M/15 N.T.S. map sheet at approximately 51° 47' 18" North latitude, 118° 51' 50" West longitude. (U.T.M. Zone 09 coordinates: 655245 E, 5548634 N; N.A.D. 27 datum).

Classic access to the property is by helicopter from the Revelstoke-Mica Dam highway that is located 12 kilometres to the east, and 2,000 metres lower in elevation in the Columbia River Valley, or alternatively from Blue River, west of the project area. No direct vehicular access is possible to the heart of the property, however a series of logging roads in the Oliver Creek Valley provides good 4X4 access to the extreme north-west corner of the property.

The property lies in the mountainous country of the Monashee Range, at the watershed separating Ruddock Creek, a tributary of the Columbia River, and Oliver Creek, which flows westward to the Adams River. The terrain of the property is defined by heavily timbered lower slopes to steeper alpine-glaciated topography at higher elevations. Property elevations range from 900 metres to 2,800 metres above sea level.

Snow cover on the property varies from year to year. The property is usually workable from August – September. Much permanent and neve snow exists on the property, and the 2000 program encountered problems with extensive snow cover in several areas.



DOUBLESTAR RESOURCES Ruddock Creek Assessment Report 2000	TITLE Ruddock Creek Project Property Location

		FILENAME:	PROJECT NUMBER	DRAWING NUMBER	
		Figure 1.CDR		1	

3.0 OWNERSHIP AND MINERAL TENURE

3.1 Ownership

The Ruddock Creek Property is subject to a joint venture agreement between Doublestar Resources Ltd. (Doublestar) and Cominco Ltd. (Cominco). Doublestar owns 58.9% interest and Cominco Ltd. holds the remaining 41.1% interest.

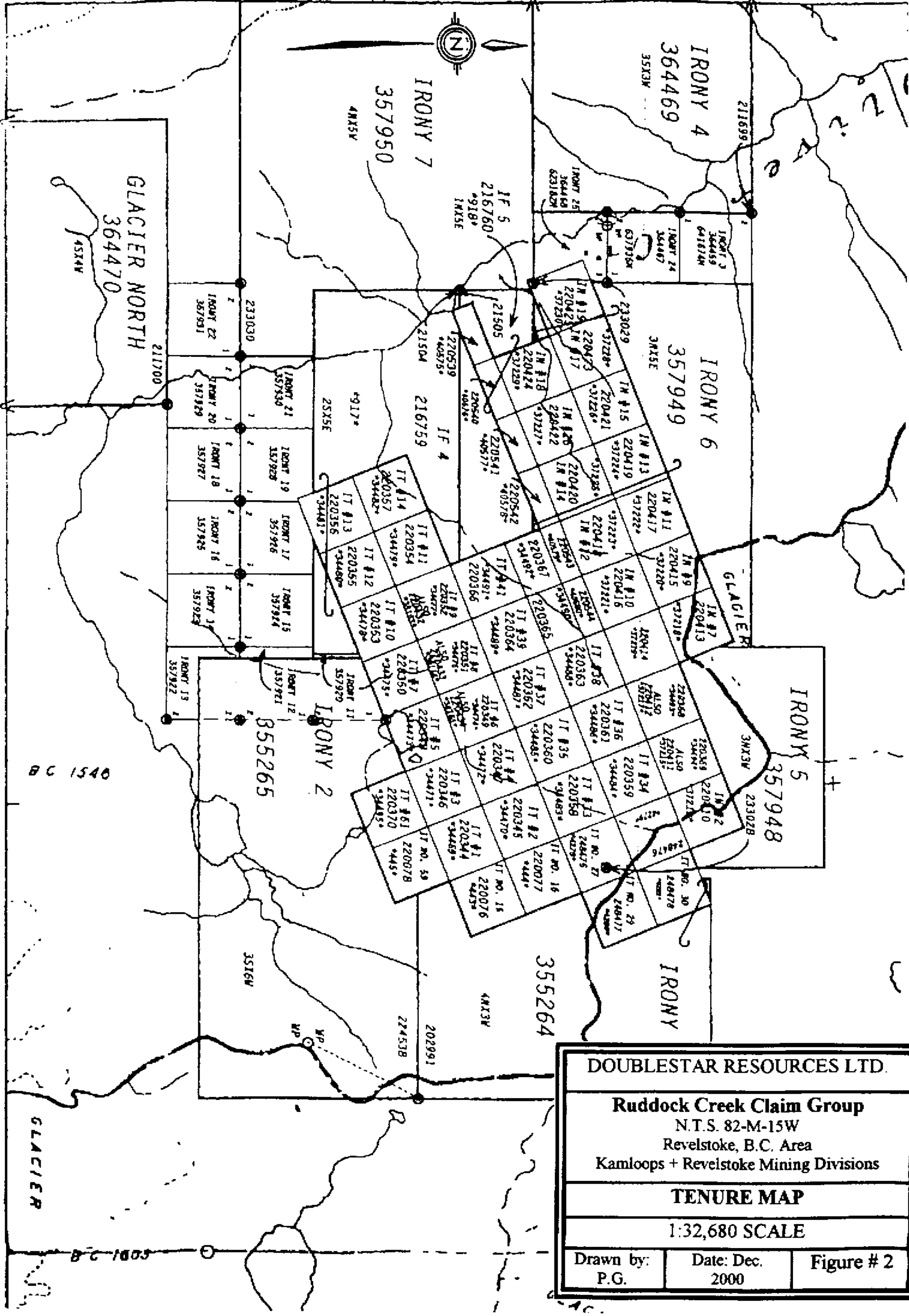
3.2 Mineral Tenure

The property consists of 57 contiguous mineral claims (2, 4-post; and 42, 2-post), which occupy an area of approximately 1,614 hectares straddling the Kamloops and Revelstoke Mining Divisions.

Table 1: Ruddock Creek Mineral Claim Tenure Status

Claim Name	Tenure	Size (units)	Expiry Date*
IF 4	216759	10	2003/11/30
IF 5	216760	5	2003/11/30
IT NO. 15	220076	1	2003/11/30
IT NO. 16	220077	1	2003/11/30
IT NO. 59	220078	1	2003/11/30
IT #1 to	220344	1	2003/11/30
IT #2 to 14	220345 to 357	1 unit each	2003/11/30
IT #33 to 44	220358 to 369	1 unit each	2003/11/30
IT #61	220370	1	2003/11/30
IN #2, 4, 6	220410, 11, 12	1 unit each	2003/11/30
IN #7 to 19	220413 to 425	1 unit each	2003/11/30
IT 83, 84, 85	220432, 33, 34	1 unit each	2003/11/30
TO #9	220539	1	2003/11/30
TO #10 to 14	220540 to 544	1 unit each	2003/11/30
IT NO. 27 to 30	248475 to 478	1	2003/11/30

* Anniversary Dates based on acceptance of this report for Assessment credits.



DOUBLESTAR RESOURCES LTD.

Ruddock Creek Claim Group
N.T.S. 82-M-15W
Revelstoke, B.C. Area
Kamloops + Revelstoke Mining Divisions

TENURE MAP

1:32,680 SCALE

Drawn by: P.G.	Date: Dec. 2000	Figure # 2

4.0 EXPLORATION HISTORY

4.1 History

Falconbridge explored the Ruddock Creek Property beginning in the 1960's and into the 1970's until a joint venture agreement was formed with Cominco in 1975. Combined exploration expenditures by Falconbridge and Cominco totalled approximately $1.16 million (SIC, 2000).

Table 1: Summary of Historic Work and Activities on the Ruddock Creek Property

YEAR	ACTIVITIES
1960	A number of Pb-Zn showings were discovered and staked.
1961	Prospecting; Geological mapping; Drill holes (940 metres) in E, M and T showings;
1962	Drill holes (1,070 metres) in E Zone; Drill holes (84.7 metres) in Q showing; Hand stripping and trenching;
1963	8 drill holes (3,229 metres) in E Zone; 17 drill holes (458 metres) at Q, R and V showings; Hand striping and trenching;
1973	Aeromagnetic survey of western portion of claims only;
1975	1 drill hole (694 metres) west of E Zone Fault;
1976	1 drill hole plus wedge (1,375 metres) west of E Zone Fault;
1977	Mapping, prospecting other target areas; 31 drill holes (740 metres XRT core; 811 metres BQ core) tested the F, G, and T zones; Master's thesis sampling; Geophysics;
1978	Structural study.
1982	Limited surface and down hole geophysics.

See Appendix A for additional discussion of exploration history.

5.0 GEOLOGY AND MINERALIZATION

5.1 Regional Geology

The property is underlain by the highly metamorphosed and structurally complex Shuswap Metamorphic Complex that consists of gneiss and metasediments engulfed in pegmatite and granite and lying on the northwestern side of Frenchman's Cap Gneiss Dome.

For a more in depth review of the regional geology of the Ruddock Creek Deposit consult the accompanying report by Peter Lewis, PhD. (See Appendix A).

5.2 Local Geology

The local geology of the Ruddock Creek Deposit is a varied succession of quartz-biotite gneiss, calc-silicate schist and gneiss with intercalated layers of marble and quartzite, forming intensely folded layers and lenses. Pegmatitic and granitic intrusive rocks comprise approximately 55% of the property.

Target mineralization is a "Sedex-type" Zn-Pb-Ag sedimentary exhalite mineralization hosted within siliceous calc-silicate and quartzite. Detailed stratagraphic successions have not been determined due to extensive pegmatite intrusions and complexity of folding. The metasedimentary rocks have been divided into two broad groups: calcareous and non-calcareous. Work in 1977 and 1978 stressed the importance of further subdivision of the stratigraphy to enable correlation and identification of marker units. The 2000 work program failed to identify correlatable marker units or horizons and as such did not attempt to determine relative stratagraphic age or order (SIC, 2000).

Structure in the area is extremely complex and several years of work by separate workers has been variously reported as broadly a convoluted package of polyphase deformed medisedimentary rocks.

Major property folds are isoclinal and obscure. One large, isoclinal synform has been identified. According to Mawer, 1976, this fold closure has been interpreted to be an overturned anticline. However, for simplicity it is always referred to as a syncline or synform. More Minor folds are more open and well defined. The axes of the major folds are interpreted to be essentially parallel, trending 020° to 030° and dipping 20° to 30° westward. Major fold hinges, boudins and other linear fabrics are interpreted to plunge 28° toward 285° (SIC, 2000).

The geological maps included with the 1976 report by Mawer provide very effective visual tools to display the geometry and location of the rocks. The 2000 program utilized these as base maps for all geological mapping, and they were found to be extremely precise.

5.3 Mineralization

Mineralization consists of conformable bedded sulphides, exposed intermittently for several kilometres along the limbs of a major fold structure. Massive sulphide layers consist of sphalerite, pyrrhotite, galena, pyrite and minor chalcopyrite, locally associated with barite and fluorite. Very fine-grained sphalerite and pyrrhotite with minor galena and rounded quartz eyes are common. Equally common are layers containing medium-grained dark brown sphalerite with interstitial quartz and scattered quartz augen. Galena and sphalerite also occur as scattered grains in marble, calcareous quartzite and fluorite. Within the sulphide layer, lenses of massive sulphides up to 1.5 metres thick occur.

There are 9 zones of mineralization identified to date: E, F, G, M, T, U, V, R, and Q which occur as contorted layers and lenses, several metres thick and are traced intermittently over a strike length of several kilometres. The E Zone hosts the bulk of mineralization on the property and is therefore the main focus of the 2000 study.

The E Zone occurs in the core of an overturned, isoclinal antiform. The mineralized area is exposed in the form of an irregular V, with the limbs open toward the southwest. The area of mineralization is 240 metres long and widens from 18 metres across the hinge zone to 60 metres across the limbs in the southwest. The hinge of this fold is interpreted to plunge 28° towards 285°. The zone has been drill tested along 180 metres of plunge length. The E Zone Fault has displaced the zone. Drilling to the west of this fault intersected only thin bands of sulphide in three holes (SIC, 2000).

For a more rigorous discussion of the property geology, see Appendix A

6.0 2000 GRAB/CHIP SAMLPING PROGRAM

Throughout the 17-day, Ruddock Creek Mapping Program, eighteen (18) individual chip samples of mineralization were sampled for assay. Sampling notes for each of these samples is included in Appendix C of this report. Further, Appendix D contains copies of the assay certificates. A 1:2,500 scale map (Figure 4) indicating sample locations and Zn + Pb values is included in the back pocket of this report. All assays were performed at Bondar Clegg Canada Ltd., 130 Pemberton Ave., North Vancouver, B.C.

Samples were taken to identify and re-assess the described historic assays from Falconbridge and Cominco. Doublestar's work found the historic work to correlate well this programs assay results.

7.0 DISCUSSION AND CONCLUSIONS

Dr. Lewis's 2000 Report has an extensive summary and several recommendations along with detailed exploration implications. The reader is invited to review that section of the the report in Appendix A.

BIBLIOGRAPHY

Fyles, J.T., 1970. The Jordan River Area near Revelstoke British Columbia, A preliminary study of lead zinc deposits in the Shuswap Metamorphic Complex. B.C. Department of Mines and Petroleum Resources, Bulletin 57.

Marshall, B., 1978. Structural Investigations of the Ruddock Creek Property. Internal consulting report prepared for Cominco Ltd., September, 1978.

Mawer, A.B., 1976a: Geological Report, Ruddock Creek Property (IT-IN Claims); Cominco Ltd., internal report, dated February 27, 1976.

Mawer, A.B., 1976b. Ruddock Creek Termination Report 1976; Internal document prepared by Cominco Exploration Ltd., November 30, 1976.

Morris, H.R., 1965. Report on Ruddock Creek Lead-Zinc Property, 1961 to 1963. Internal report prepared for Falconbridge Nickel Mines Ltd., March 12, 1965.

Nichols, 1977. 1977 Termination Report, Ruddock Creek; Cominco Ltd., internal report, dated March 1978.

Snowden Industry Consultants, Reddy D. and Ansell S., 2000. Sustut Property and Ruddock Creek Property, British Columbia, Review of Proposed Work Programs and Budgets. P.N. 00V107.

February 19, 2001

Paul D. Gray, B.Sc.

APPENDIX A:

Structural Analysis of the Ruddock Creek Zn + Pb Property, SE British Columbia

NTS Map # 82M/15

51° 47' 18" N 118° 51' 50" E

Prepared for:

Doublestar Resources Ltd.
#305 1549 Marine Drive
West Vancouver, B.C. V7V 1H9

December 6, 2000

LEWIS GEOSCIENCE SERVICES INC.

15715 Mountainview Drive, Surrey, B.C., Canada, V4P 2W9 phone:(604) 531-4604

Summary

A three week field mapping program was completed on the Ruddock Creek property during late August and early September, 2000, with the objective of evaluating structural controls on stratabound massive sulphide occurrences. During this program, massive sulphide occurrences and adjacent areas in the eastern half of the property (E zone, F, G, M, and T showings) were mapped at scales of 1:2,500 and 1:5,000. The new mapping data and structural interpretations were integrated with existing exploration data to refine geological models and help design future exploration programs.

Host Rock Succession

Massive sulphide occurrences at Ruddock Creek occur within a complexly deformed sequence of high-metamorphic grade sedimentary and volcanic rocks, cut by voluminous granitic intrusions. The metamorphic sequence consists of interlayered biotite schist, quartzo-feldspathic schist, calc-silicate gneiss, quartzite, marble, amphibole gneiss, and pyroxene gneiss. These rock types alternate on scales from a few centimeters to several tens of metres. All rock types occur at multiple levels within the section exposed on the property. This repetition, combined with intense deformation and metamorphism, extensive granitic rocks, and lack of sedimentary facing direction indicators precludes definition of a stratigraphic succession that is applicable throughout the project area. Therefore, relational terms comparing positions of various stratigraphic sequences in this report are limited to geographic and topographic positions. Three lithostratigraphic domains can be defined on the property, each of which contains a relatively consistent lithologic succession: 1) The T showing lithologic domain consists of a calc-silicate + quartzo-feldspathic biotite schist sequence that contains massive sulphide layers, passing northward into pyroxene gneisses, and a thick sequence of biotite schist. 2) The E zone structural hangingwall lithologic domain has at its base a sequence of mineralized quartzites and calc-silicates, passing upward into biotite schist, quartzofeldspathic schist, and calc-silicate gneiss alternating in layers up to 5 metres thick. These in turn pass upward into amphibole gneiss, a thick calc-silicate sequence, and at highest levels, pyroxene gneiss. The T showing lithologic domain and E zone hangingwall lithologic domain are likely lateral equivalents, and the thicker, more lithologically diverse sequence associated with mineralization in the E zone hangingwall domain indicates the presence of a subbasin in that area. 3) The E zone structural footwall lithologic domain is separated from the other two lithologic domains by an inferred thrust fault. It is dominated by biotite schist and calc-silicate + marble, which alternate over tens of metres. No mineralization is known within this sequence, and based on inferred thrust fault geometry, its stratigraphic position is likely above that of the other lithologic domains.

Granitic rocks on the property range from narrow dykes to large irregular bodies. Grain textures vary from fine-grained equigranular to pegmatitic. Contact relations indicate that both magma intrusion into dilatent fractures and in-situ replacement of the metamorphic rock package were active. The pegmatite can form 90 – 95% of the rock volume in some parts of the property, hindering mapping of the metamorphic rock sequence.

Folding and ductile rock fabrics

The Ruddock Creek property contains abundant folds on several scales, along with intensely developed penetrative rock fabrics. Earliest deformation is manifested in a strong foliation/grain orientation fabric that is parallel to compositional layering, termed S_0/S_1. Foliation surfaces show a moderate to strong grain alignment, termed L_1. D_1 folds interpreted to be coeval with these fabrics are limited to small, rootless intrafolial isoclines, folded quartz veins, and folded pegmatite dykes. Contrary to previous interpretations, no megascopic (property scale) D_1 folds have been identified.

The dominant folds on the Ruddock Creek property deform the S_0/S_1 foliation, and therefore formed during a later (D_2) deformation event. At least six major D_2 folds cross the eastern part of the Ruddock Creek property. These folds have recumbent axial surfaces that dip moderately to the southwest or northwest, and tight to isoclinal hinges. Fold hinges in the western part of the property are more open than those to the east. Axes plunge moderately to the west, parallel to the L_1 mineral lineation. Mesoscopic (outcrop scale) D_2 folds occur in all rock types throughout the property. These smaller folds show asymmetry consistent with their position on the megascopic D_2 folds, and help define the position of D_2 megascopic axial surface traces.

The E zone massive sulphide body lies within the hinge of a major north-closing synformal fold. Because of its nearly isoclinal form, some previous workers interpreted this structure as a D_1 fold. However, both the synform and cogenetic second-order asymmetric folds on its limbs are outlined by S_0/S_1 foliation. Therefore, the E zone synform is most likely the same age as other megascopic folds on the property, and has been accordingly designated a D_2 structure.

Shear zones, mylonite zones

Shear zones at Ruddock Creek range from narrow (< 2 m) planar zones with mylonitic to ultramylonitic fabrics, to wider zones containing asymmetric shear bands within schistose rocks. Foliation and lineation in these zones are parallel to S_0/S_1 and L_1 in adjacent rocks, but are more intensely developed and contain abundant indicators of shear strain. The most significant shear zones on the property include a narrow west-dipping mylonite zone at the G showings, and a broader west-dipping shear zone roughly equidistant between the M showing and the E zone. These zones have previously been mapped as thrust faults; however, well-defined kinematic indicators within them show normal (top-to-west) movement. Based on their kinematics, they are tentatively interpreted as having formed during Tertiary extension. Despite the intense ultramylonitic fabrics, the massive sulphide layers at the G showing are laterally continuous with little displacement.

Thrust faults

Two thrust faults not identified in previous exploration programs have been inferred on the basis of lithologic distribution patterns. A fault, sub-parallel to layering, is interpreted to follow the lower limb of the E zone synform, evidenced by both a vergence reversal in minor D_2 folds and the significant differences in the lithologic successions present on the two synform limbs. This fault probably formed synchronous with D_2 folding, and does not likely cut the E zone mineralization in the subsurface. Because it is pre- to syn-metamorphic and predates most of the pegmatite intrusion, this fault is not recognizable in the field.

A second thrust fault is inferred to separate the M showings from the E zone and T, F, and G showings. This fault is based on the supposition that all of the showings occur within the same stratigraphic interval; if mineralization occurs at multiple stratigraphic levels, this fault is not required. If the fault exists, it crosses an area covered by glaciers and intruded by voluminous pegmatite, and will be difficult to document.

E zone fault

A steeply east-dipping fault that crosses the project area to the west of the surface showing of the E zone cuts and displaces the mineralized zone at depth. Brittle kinematic indicators exposed along the surface trace of the fault indicate normal movement in a nearly down-dip direction. Compilation of existing drillhole data and new surface data corroborate this interpretation: the massive sulphide zone in the hinge of the synform is interpreted to have been displaced down-dip about 300 metres in the hangingwall (west) fault block.

Exploration Implications

1. Nearly half of the downdip extension of the E zone mineralization in the footwall of the E zone fault has not been drill tested, and is relatively accessible from surface drillholes.

2. The downdropped extension of the E zone mineralization in the hangingwall of the E zone has been tested in only two holes. Over 250 metres of plunge extent can be tested in surface drillholes less than 700 metres long.

3. Because the E zone synform is interpreted to be a D_2 fold, the complex refolded fold patterns envisaged by previous workers are unlikely. Consequently, the surface trace of mineralization inferred for the lower limb in areas lacking exposure is invalid.

4. The massive sulphide interval present at the E zone may occur at depth in the E zone structural footwall lithologic domain, increasing the prospectivity of the area southeast of the E zone showing.

5. The E zone area has several lithologic characteristics absent from other occurrences, and may represent a depositional subbasin that in part localized mineralization. The amphibolite gneiss at the E zone may be a metamorphosed (chloritic?) alteration zone; if so, i) the E zone hangingwall succession may be the stratigraphic footwall to mineralization, and ii) the amphibolite gneiss may be a useful exploration guide elsewhere on the property.

Table of Contents

1. Introduction 8
 Exploration history 9

2. Stratigraphy and Intrusive Rock Units 11
 E zone structural footwall lithologic domain 11
 E zone structural hangingwall lithologic domain 14
 T showing lithologic domain 14
 Correlation between lithologic domains 16
 Intrusive Rock Units 16

3. Structural Overview 19
 Penetrative strain fabrics 19
 Folds 24
  E zone synform 24
 Thrust faults 27
 Mylonite zones / shear zones 28
 E zone fault and other brittle faults 30
 Summary of deformation events 32
  Early, regional foliation forming event (D_1) 32
  D_2 folding and possible thrusting 33
  D_3 ductile extension 33
  Late brittle faulting 33

4. Structural Characteristics of Mineral Occurrences 35
 E zone 35
  Primary thickening vs. structural thickening 35
  Deep E zone extensions 35
 F showing 37
 G showing 37
 M showing 38
 T showing 38

5. Exploration Implications and Recommendations 40

References: 42

List of Figures

Figure 1.1: Map of the Ruddock Creek Property, showing 2000 field program. 8

Figure 2.1: Distribution of major lithologic domains, and representative stratigraphic columns. 16

Figure 3.1: Simplified structural map of the Ruddock Creek Property. 20
Figure 3.2: Stereonet projections showing orientations of S_0/S_1 21
Figure 3.3: Stereonet projections showing orientations of L_1 22
Figure 3.4: Stereonet projections showing orientations of mesoscopic folds.......... 26
Figure 3.5: Stereonet projection showing mylonitic fabric elements 30
Figure 3.6: Secondary fault data for structures adjacent to the E zone fault 32

List of Photographs

Photo 2.1: Mafic gneiss, showing fine banding, garnetiferous layers 13
Photo 2.2: Calc-silicate gneiss with interstratified calcite layers, epidote + diopside rich layers. 13
Photo 2.3: Massive marble with layering defined by thin micaceous laminations. 13
Photo 2.4: Thinly- to medium layered amphibole gneiss. 13
Photo 2.5: Contact between biotite schist and calc-silicate. 13
Photo 2.6: Biotite schist with thin leucocratic bands. 13
Photo 2.7: Quartzo-feldspathic schist. 18
Photo 2.8: Quartzite with fine to medium bedding defined by micaceous partings.. 18
Photo 2.9: Folded granitic sills in quartzo-feldspathic schist. 18
Photo 2.10: Biotite zenoliths with diffuse margins enclosed in pegmatite 18
Photo 2.11: Massive, semi-concordant tremolite unit.......... 18

Photo 3.1: S_0/S_1 foliation + compositional layering in quartzo-feldspathic schist 23
Photo 3.2: View looking down on S_0/S_1 surface, showing L_1 lineation 23
Photo 3.3: Boudinaged layer in amphibole gneiss 23
Photo 3.4: Asymmetrically folded pegmatite dyke cutting biotite schist 23
Photo 3.5: Asymmetric boudinage of pegmatite layer in biotite schist 23
Photo 3.6: Recumbent symmetric D_2 folds. 25
Photo 3.7: Recumbent S (south verging) fold pair outlined by quartzite 25
Photo 3.8: Recumbent tight fold in calc-silicate sequence 25
Photo 3.9: Tight asymmetric S (south verging) mesoscopic fold in sulphide-bearing quartzites 25
Photo 3.9: Finely-laminated, siliceous ultramylonite 29
Photo 3.10: Calc-silicate gneiss in shear zone showing top-to-west transport 29
Photo 3.11: Rotated boudin of feldspathic layer showing counterclockwise rotation..... 29
Photo 3.12: Highly disharmonic sheath folds in shear zone. 29
Photo 3.13: Shear bands in biotite schist within shear zone north of T showings. 29

Photo 3.14: View of project area east of the E zone, showing NNE and NNW trending topographic breaks. 34
Photo 3.15: Riedel fractures (arrows) in outcrop adjacent to E zone fault 34

Photo 4.1: Upper F showings: massive sulphide layer. 39
Photo 4.2: Upper G showings: discontinuous massive sulphide lenses 39
Photo 4.3: M showing: massive sulphide layer forming dip-slope surface of nunatak ... 39
Photo 4.4: M showing: durchbewegung (milled) texture. 39

List of Tables

Table 1: Diamond drilling completed on the Ruddock Creek Property. 9
Table 2.1: Metavolcanic / metasedimentary units present at the Ruddock Creek property and correlation with previous lithologic designations 12
Table 2.2: Intrusive units present at the Ruddock Creek property and correlation with previous lithologic designations 17

Map Sheets
(all sheets folded in back pocket)

1. 1:2,500 scale geology, Ruddock Creek Property
2. Geological cross sections, Ruddock Creek Property
3. E zone structural interpretation

1. INTRODUCTION

The Ruddock Creek property in south-central British Columbia contains Zn + Pb mineralized massive sulphide layers within complexely-folded, high-grade metasedimentary and metavolcanic rocks cut by fine-grained to pegmatitic granitic intrusions. Massive sulphides are stratabound, and are interpreted to occur within a single stratigraphic interval. This interval can be traced through a series of large-scale folds, discontinuously exposed over a strike length of about 10 km. The principal massive sulphide occurrences on the property, from east to west, are the E zone, and the F, G, M, T, U, Q, R, and V showings. Outcrop is extensive over most of the topographically higher parts of the property; however, snow cover persists until late summer at higher elevations.

This study focused on evaluating the structural history of the property, with the objective of defining controls on the distribution of massive sulphide bodies in preparation for drill target definition. Structural and lithologic mapping were completed during the period August 18th – September 4th 2000. Mapping was completed for the eastern portion of the property, including the E zone and F, G, and M showings, at 1:5,000 scale (Fig. 1.1).

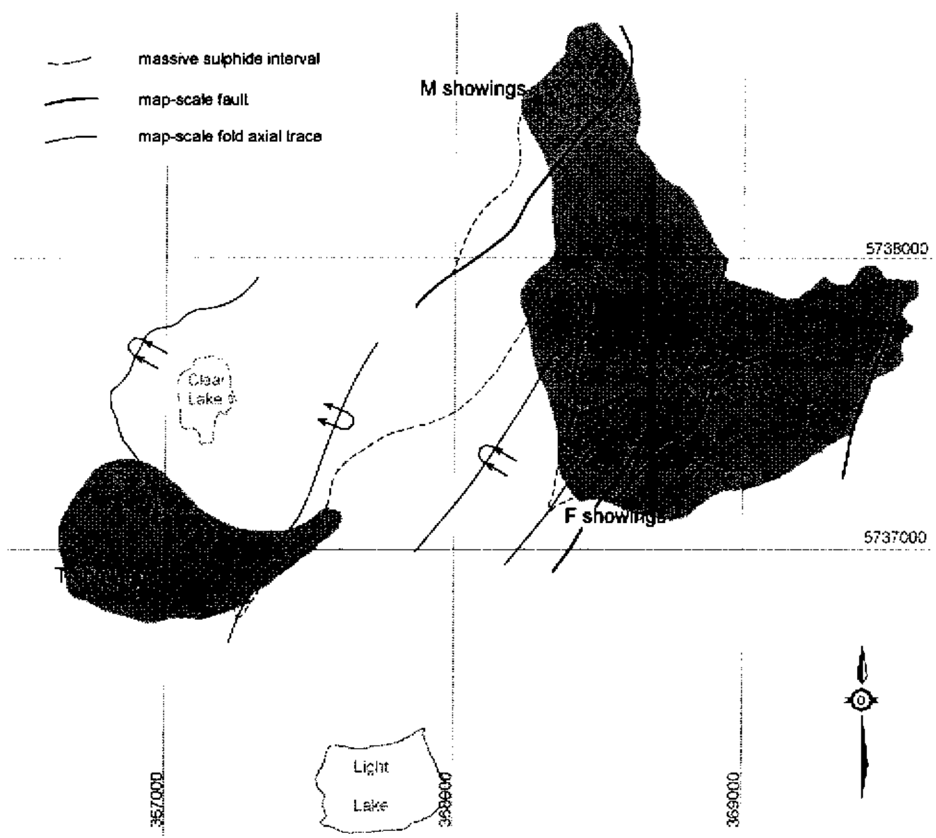


Figure 1.1: Map of the eastern part of the Ruddock Creek Property, showing the locations of the principal Zn + Pb showings and the areas mapped during the 2000 field program (gray areas). U, Q, R, and V showings are west of the areas shown.

The area surrounding the E zone was also mapped at 1:2,500 scale, to provide more detailed control on the lithologic successions and structural features present in the area of greatest economic interest. The T showing area was mapped at 1:5,000 scale, and a reconnaissance visit to the U showing was completed. The Q, R, and V showings were not visited in this study.

Exploration history

Exploration on the Ruddock Creek Property dates from the initial discovery and staking of massive sulphide mineralization in 1960. The most extensive exploration was conducted by Falconbridge over the period 1961-1963. During this phase of exploration, most of the property was mapped at scales ranging from 1" = 20' to 1" = 400'. Core drilling was completed at the E zone, and the G, M, T, Q, U, and V showings (Table 1). Cominco Ltd. optioned the property in 1975, and completed two additional drillholes in 1975 and 1976, exploring for deep extensions of the E zone. Cominco also conducted additional detailed mapping at the F and G showings, and calculated an "indicated potential" for the E zone of 1.5 MT grading 10% Pb+Zn, increasing to 3.0 MT if the E zone is projected westward to the E zone fault (Mawer, 1976).

Table 1 summarizes drillholes completed to date on the Ruddock Creek property. A total of nearly 28,000 feet have been drilled, with the E zone, and G, M, T, U, R, V, and Q zones represented. Core was stored on site, and most is presently in poor condition.

Table 1: Diamond drilling completed on the Ruddock Creek Property.

Year / Company	Drillholes	Total drilled	Areas tested
1961 / Falconbridge	E-1 to E-19 M-1 to M-15 T-1 to T-3	3084'	E, M, T
1962 / Falconbridge	E-20 to E-37 Q-1 to Q-3 T-4 to T-8	3510'	E, Q, T
1963 / Falconbridge	ED-1 to ED-8 Q-4 to Q-13 R-1 to R-3 U-1 to U-3 V-1	10,593'	E extension, Q, R, U, V
1975-76 / Cominco	C-75-1 C-76-1, 1A	4512'	Upper G; Offset E zone
1977 / Cominco	UG-77-1 to UG-77-12 LG-7-1 to LG-77-8 F-77-1 to F-77-5 T-77-1 to T-77-6	5090' (31 holes)	G, F, Lower T

Geological mapping completed during the previous exploration programs varies in quality and level of detail. In most areas mapped, outcrops and lithologic contacts are well located, and there was clearly a substantial surveying effort incorporated in the mapping. The detailed (1" = 40') geological map of the E zone (Morris, 1965) is extremely accurate and detailed, and it is unnecessary to duplicate this mapping. However, there are several shortcomings of the 1" = 400' property map, which limit its application to future exploration and necessitated the present mapping effort:

1. The lithologic designations are too generalized to identify the sequences of units associated with mineralized showings, and to identify potential structural repetition of lithology on the property.

2. The map is strictly an outcrop map, with lithologic contacts identified only where they are exposed in outcrop. Because approximate and inferred contacts between outcrops are not included, it is difficult to assess continuity of lithologic units and identify mappable sequences using this map.

3. Structural data are limited, for both mesoscopic (outcrop scale) and megascopic (mappable) features. Mesoscopic structural features that are essential to interpreting the larger-scale structural geometry and deformation history, such as fold asymmetry and sense of shear indicators, are not included.

Falconbridge competed detailed (1" = 40') geological cross sections through the E zone area during its exploration program, as well as several property-scale sections showing stratigraphic and structural correlations of the massive sulphide interval between the different showings. They also constructed structure contour maps of the subsurface projection of the E zone, in order to better target portions of the mineralization offset by faulting. Cominco likely relied heavily on this interpretation in their deep drilling in 1975 and 1976.

Cominco contracted a structural evaluation of the property in 1978 (Marshall, 1978). This study corroborated many of the general interpretations made by Falconbridge, and also provided additional detail to the interpretation of lithologic sequence, structural fabrics, and folding history.

2. Stratigraphy and Intrusive Rock Units

The Ruddock Creek property contains a variety of amphibolite-grade metasedimentary and metavolcanic rocks, cut by granitic intrusions that range texturally from fine-grained to pegmatitic. Contacts between lithologic units of the metamorphic succession are difficult to follow in many areas due to the high proportion of granitic intrusive rocks.

Intense deformation and metamorphism have obliterated any primary facing direction indicators in the metasedimentary and metavolcanic rocks. Structural repetition, due to both folding and thrust faulting, is documented in several locations on the property and could easily occur elsewhere where it is not yet recognized. Therefore, the metamorphic rock sequence portrayed on the property map and described below is best considered a structural sequence, composed of units with uncertain stratigraphic relationships.

The metasedimentary and metavolcanic rocks on the property comprise schists, gneisses, and quartzites, which can be divided into eight compositionally distinct lithotypes (Table 1, Photos 2.1 – 2.8). Individual lithotypes can form layers as thin as a few centimetres, to as thick as several tens of metres. Most lithotypes occur at multiple levels within the section, and thus the individual lithotypes do not comprise map units in a formational sense; however, they do form the basic map units shown on map sheets 1 and 2. Because of constraints imposed by the scale of mapping, only lithotypes greater than 2-3 metres thick are shown on map sheet 1. Lithologic intervals composed of lithotypes that alternate in thinner layers are identified according to the dominant rock type within the interval. Table 2 summarizes the lithologic characteristics of the lithologic divisions, and compares them to map units employed in previous reports.

Although the individual metamorphic lithotypes do not form unique map units, the thickness and distribution of each shows systematic variation across the map area. This variation defines three lithologic domains: the E zone structural hangingwall domain, the E zone structural footwall domain, and the T showing domain (Fig. 2.1).

E zone structural footwall lithologic domain

Massive sulphides at the E zone occur within the hinge area of a property-scale, recumbent, tight to isoclinal synform. 1" = 40' scale mapping by Falconbridge (Morris, 1965) documents inverted lithologic successions on the two opposing limbs in the immediate hinge area. However, property-scale mapping in this study shows significantly different lithologic successions on the two limbs beginning 30 – 50 metres from the fold axial surface. Based on these lithologic differences and structural evidence (section 3 below), a fault sub-parallel to layering is interpreted on the lower fold limb (Fig. 2.1), referred to in this report as the Camp Fault, because it crosses the area near the location of the main camp used in previous exploration. Rocks structurally below the Camp Fault are assigned to the E zone structural footwall domain, and above, the E zone structural hangingwall domain. The relative stratigraphic position of the lithologic sequences in the two domains is uncertain.

Table 2.1: Metavolcanic / metasedimentary units present at the Ruddock Creek property and correlation with previous lithologic designations

Primary Rock Type	Map Code	Description	Assignment by Morris, 1965	Distribution
mafic gneiss	mg	Thinly-banded to massive, dark green, fine-grained pyroxene +/- amphibole gneiss; subordinate plagioclase; garnet common (Photo 2.1)	Not differentiated; included in units QA and HGM amphibolitic quartzite, hornblende-biotite-garnet schist)	Occurs structurally 100-200 metres above F and G showings; 30-50 metres above T showings
calc-silicate gneiss, marble	cs	Thinly- to thickly-banded, compositionally varied unit containing alternating bands of fine- to coarse-grained quartzite, marble, diopside-rich and amphibolitic marble and quartzite (Photo 2.2)	LQ (quartzitic marble)	Widely distributed through project area, occurs both structurally above and below massive sulphides
marble	ma	Tan to light gray, medium to very coarse-grained, massive marble, with subordinate micaceous or diopside partings (Photo 2.3)	Not differentiated; included in LQ (quartzitic marble)	Forms mappable unit between F and G showings, thick units on slope structurally below E zone
amphibole gneiss	ag	Thinly- to medium- banded, amphibole + plagioclase gneiss; contains garnetiferous layers; distinguished from calc-silicate gneiss by lack of calcite and by abundance of amphibole; may represent metamorphosed chloritic alteration (Photo 2.4)	QA, HGM, ALQ (amphibolitic quartzite and others)	Occurs as thin (not mappable) layers within calc-silicate gneiss; occurs as thick mappable unit only in hangingwall to E zone, and pinches out abruptly along strike.
biotite schist	bs	Highly-schistose, coarse-grained biotite containing up to 40% by volume foliation-parallel to moderately discordant leucocratic segregations (probably both transposed veins and metamorphic segregations) consisting of fine- to medium-grained quartz and feldspar; abundant garnet in some intervals (Photo 2.5, 2.6)	MQ (biotite quartzite schist)	Occurs structurally above massive sulphides at E zone and F and G showings, forms thick unit structurally overlying T showings, and in several layers (with possible structural repetition) below E zone.
quartzo-feldspathic biotite schist	qb	Finely-banded to massive, schist to semi-schist, consisting of quartz, feldspar, and biotite in varying proportions; distinguished from biotite schist by finer grain size, less schistose texture, and lack of leucocratic segregations. (Photo 2.7)	Not differentiated; included in either QM (quartzite, slightly micaceous) or MQ (biotite quartzite schist)	Abundant immediately above massive sulphide interval at E zone and T showings.
quartzite, quartzose schist	qz	Thinly- to thickly-bedded, fine- to medium-grained recrystallized quartz grains with variable percentage of fine biotite or amphibole grains; commonly includes decimetre to metre thick schistose, marble, and calc-silicate layers not mappable at property scale; gradational into quartzo-feldspathic biotite schist (Photo 2.8).	QZ (thin, mineralized quartzite) or QM (quartzite, slightly micaceous)	Usually spatially associated with massive or disseminated sulphide mineralization; thickest at E zone






Photo 2.1 (upper left): Mafic pyroxene gneiss, showing fine banding, garnetiferous layers; T showing area.
Photo 2.2 (upper right): Calc-silicate gneiss, with interstratified calcite layers, epidote + diopside rich layers; E zone structural hangingwall.
Photo 2.3 (middle left): Massive marble layer, showing layering defined by thin micaceous laminations; southeast of E zone.
Photo 2.4 (middle right): Thinly- to medium layered amphibole gneiss, E zone hangingwall.
Photo 2.5 (lower left): Contact between medium- to coarse-grained biotite schist (lower third of photograph) and calc-silicate gneiss comprising interlayered marble, diopside + epidote-rich layers; south of E zone.
Photo 2.6 (lower right): Biotite schist with thin leucocratic bands; E zone footwall.

The E zone structural footwall lithologic domain is well exposed on the steep, southeast-facing slopes below the E zone. It consists primarily of biotite schist, marble, and calc-silicate interlayered on the scale of several metres to several tens of metres (Fig. 2.1). Minor structures, such as asymmetric secondary folds, suggest that this interlayering may be in part structural, and map sheets 1 and 2 illustrate the synformal axial trace inferred from this evidence. Both the lower and upper limbs of this fold consist of a carbonate package sandwiched within biotite schists. On the lower limb, this carbonate package is a pure light gray marble in the east, which grades westerly along strike into a two-part succession with a lower, calc-silicate gneiss division and an upper marble division (Fig. 2.1). On the upper limb, the carbonate package is dominated by calc-silicate gneiss, with subordinate lenses of gray to tan marble. The biotite schist that overlies the calc-silicate gneiss on the upper limb is in turn overlain by quartzo-feldspathic mica schist containing lenses of quartzite and minor calc-silicate.

E zone structural hangingwall lithologic domain

The E zone structural hangingwall lithologic domain is well exposed on the slopes above the E zone and to the west of the E zone fault. Quartzites, micaceous quartzites, and subordinate limestone, calc-silicate, and biotite schist containing two main massive sulphide layers form the lowest rocks within the succession. Falconbidge's mapping of the E zone (Morris, 1965) shows this lower sequence in detail. Biotite schists with minor calc-silicate and quartzo-feldspathic schist structurally overlie the quartzite + massive sulphide interval. These are in turn overlain by amphibolitic gneiss at the E zone, which grades eastward into a sequence dominated by interlayered calc-silicate gneiss and quartzo-feldspathic schist. Highest exposed rocks in the E zone area are calc-silicate gneisses with subordinate interlayered quartzo-feldspathic schist and marble.

West of the E zone fault, a similar lithologic sequence is exposed in the structural hangingwall to the F showing, although the large volume of pegmatite here precludes defining the sequence to the same level of detail. Displacement along the E zone fault has exposed higher levels here: mafic pyroxene gneisses overlie calc-silicate rocks correlated with those forming highest exposed levels to the east of the fault.

T showing lithologic domain

Three main lithologic units are exposed at the T showing area. Structurally lowest rocks, which contain the massive sulphide lenses, consist of quartzo-feldspathic schists with lesser quartzite, biotite schist, and calc-silicate gneiss. This package is overlain by mafic gneisses that are lithologically similar to those in the uppermost part of the E zone structural hangingwall domain. Highest rocks in the T showing lithologic domain are biotite schists, which are exposed over large areas and form a monotonous unit a least several hundred metres thick north of the T showings.

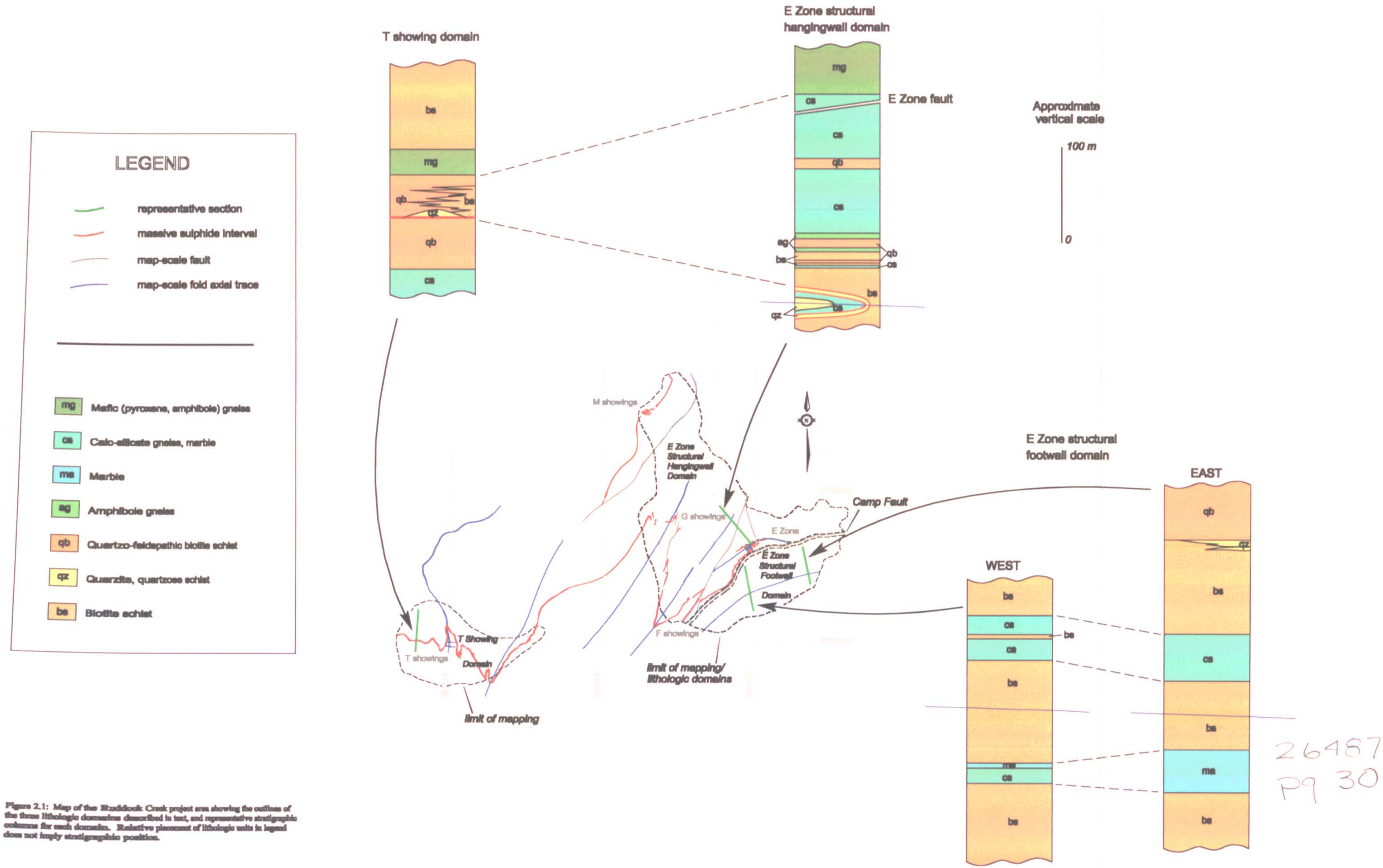


Figure 2.1: Map of the Ruddock Creek project area showing the outlines of the three lithologic domains described in text, and representative stratigraphic columns for each domain. Relative placement of lithologic units in legend does not imply stratigraphic position.

26487
pg 30

Correlation between lithologic domains

The Camp Fault, which separates the E zone structural footwall domain and the other two lithologic domains, has an uncertain offset history. The inferred fault trace is sub-parallel to lithologic contacts, consistent with formation as a thrust fault, possibly during regional folding. If so, the footwall domain may represent a higher stratigraphic level than the hangingwall domain (because it lies in the lower plate of the thrust fault), and the thick biotite schist sequences may be roughly equivalent to those in the upper part of the T showing lithologic domain. This correlation implies that the massive sulphide interval may be present at depth in the footwall domain. Because fault geometry is poorly constrained and is certainly modified by subsequent deformation, it is not possible to estimate displacement direction or magnitude.

The massive sulphide interval provides a stratigraphic tie between the E zone hangingwall lithologic domain and the T showing lithologic domain. In both domains, massive sulphides occur within a lithologically varied interval containing quartzite, calc silicate, quartzo-feldspathic schist, and biotite schist. If the mafic gneiss interval present in both is laterally equivalent, this lithologically varied interval is significantly thicker at the E zone than at the T showing. This might indicate that the E zone area occupied a subbasin during massive sulphide deposition.

Amphibolite gneiss, though present as thin layers within the calc-silicate gneiss, only forms a mappable lithologic unit in the E zone hangingwall domain. The localization of this rock type adjacent to the thickest known massive sulphide layers suggests that it may be a metamorphosed alteration zone, possibly originally chloritic in composition. This has two important implications: first, the occurrence of similar rocks elsewhere on the property may be a useful exploration guide; second, the E zone hangingwall lithologic domain, and by inference, the T showing lithologic domain, represent the original stratigraphic footwall to the massive sulphide interval.

Intrusive Rock Units

Intrusive rocks on the property include small, tabular, massive tremolite + actinolite bodies, and voluminous dykes, sills, stocks, and plutons of granitic composition (Table 2.2). The latter comprise roughly 50% of the rock present on the property (Mawer, 1976; Fyles, 1970), and are highly variable texturally and structurally. They range from planar dykes that cut shallowly or sharply across compositional layering, to large, irregular bodies containing abundant zenoliths of country rock (Photos 2.9, 2.10). Grain size ranges from fine to pegmatitic, although previous workers refer to all as "pegmatites". Some of the granitic rocks possess a grain orientation fabric parallel to foliation in the adjacent country rock, and intrusive contacts are often deformed. In some areas, pegmatite occurs in lenticular boudins around which foliation wraps. Elsewhere, granitic rocks of similar composition and grain size lack any visible grain fabric, and contacts cut across folds and structural fabrics in the adjacent country rock. Together, these relationships suggest that formation of the granitic rocks was in part synchronous with, and in part outlasted deformation.

The origin of these granitic rocks has been the subject of debate among previous workers: some suggest magma emplacement within dilational fractures (Marshall, 1978), while others favor in-situ replacement of the metamorphic package (Fyles, 1970). Contact relations of the granitic rocks support both processes. Dykes can have sharp, planar contacts that cut across lithologic contacts in the metamorphic rock sequence, implying infilling of dilational fractures. However, several features indicate in-situ melting and/or replacement of the country rock:

1. Many of the zenoliths have diffuse, irregular contacts with the enclosing pegmatite (Photo 2.9).

2. Layering within adjacent zenoliths is consistently oriented (Map sheet 2).

3. Distinctive compositional layers or lithologic contacts within zenoliths can be traced through adjacent zenoliths with no apparent offset.

Massive tremolite/actinolite bodies occur on the property near the T showing and E zone. They have tabular forms with contacts concordant to or cutting shallowly across foliation, and occur at several structural levels. Although they are very coarse-grained and lack grain orientation fabrics, they are boudinaged and their contacts are deformed. They most likely originated as ultramafic dykes, which have been transposed into their present semi-concordant geometry during subsequent deformation.

Table 2.2: Intrusive units present at the Ruddock Creek property and correlation with previous lithologic designations

Primary Rock Type	Map Code	Description	Assignment by Morris, 1965	Distribution
pegmatite/granite	pg	Highly varied: large, irregular intrusions to planar dykes; fine-grained equigranular to pegmatitic; contacts can be either tightly folded, or can cut across folds in country rock; some outcrops contain grain-orientation fabric parallel to S_0/S_1 in adjacent metamorphic rocks (Photos 2.9, 2.10)	π	Occurs throughout area; volumetrically most significant in area between G showings and T showings, where country rock occurs only in isolated zenoliths.
massive tremolite/actinolite	tr	Tabular layers up to 15 metres thick slightly discordant to layering in enclosing rocks; coarse-grained and massive internally, but contacts strongly boudinaged. Contains contact zones up to 30 cm thick consisting of very coarse-grained biotite (Photo 2.11)	Not differentiated	Spatially associated with massive sulphides at E zone and T showing; occurs at several structural levels


Photo 2.7 (left): Quartzo-feldspathic schist, alternating feldspathic bands (white) and garnet-rich quartzose bands (gray); east of E zone.
Photo 2.8 (right): Quartzite, showing fine to medium layering defined by micaceous partings; T showing area.

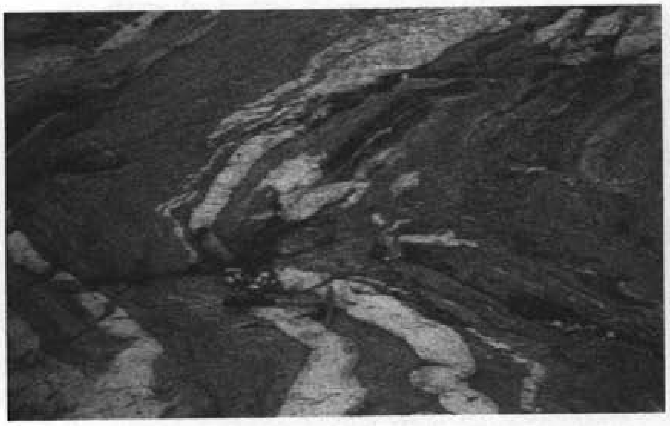



Photo 2.9 (left): Folded granitic sills in quartzo-feldspathic schist; near G showings.
Photo 2.10 (right): Biotite zenoliths with diffuse margins enclosed in pegmatite; note parallelism of foliation in zenoliths, and continuity of leucocratic band in zenoliths (arrows), supporting in-situ melt origin of granitic pegmatite; E zone footwall.

Photo 2.11: Massive, semi-concordant tremolite unit approximately 8 m thick; east of E zone.

3. Structural Overview

The Ruddock Creek project area has a complex, polyphase deformational history, manifested in penetrative cleavage fabrics, folds on several scales, shear zones, mylonitic zones, and brittle faults. The dominant map-scale structural features that control the distribution of mineralized strata on the property include several tight to isoclinal recumbent folds, and younger brittle fault zones. Figure 3.1 identifies and shows the positions of these major structures.

Assigning specific structural features at Ruddock Creek to a sequence of deformation events is complicated by several factors: 1) structural styles (e.g., fold hinge geometry) formed during a single event can vary significantly, due to different mechanical properties of different parts of the lithologic succession, and to local and regional strain gradients; 2) progressive deformation may result in overprinting structures formed during a single event, but giving the appearance of multiple events (e.g., refolded folds); and 3) early structures may be completely obliterated by later penetrative ductile strain events.

Penetrative strain fabrics

Metamorphic rocks throughout the project area contain a planar fabric defined by parallel preferred grain orientation or by mineralogical layering (Photos 3.1). Because the grain orientation fabric is parallel to compositional layering, the combined fabric is termed S_0/S_1. The S_0/S_1 fabric contains a strong mineral orientation lineation (L_1) (Photo 3.2), defined by either aligned long axes of minerals or elongate segregations of like minerals. These grain orientation fabrics are defined dominantly by biotite, amphibole, and rarely calcite. Other major minerals, such as quartz and feldspar, although they once had elongate or flattened shapes, presently have equant forms due to post-tectonic annealing.

On the outcrop scale, S_0/S_1 imparts a strong cleavage in most rock types, and is the dominant structural fabric visible. Juxtaposition of lithologic layers of differing competency commonly results in boudinage structures (Photo 3.3). In most areas, the S_0/S_1 foliation is a symmetric fabric with no evidence for shear strain during its formation. Non-coaxial strain features, including shear bands, asymmetric boudins, and rotated boudins occur in isolated locations (Photos 3.4 – 3.5), as well as within several mylonitic shear zones that are described separately below. The non-coaxial strain indicators occurring outside of the mylonite zones show varied transport directions, with top-to-the-west (parallel to L_1) being most common.

S_0/S_1 foliation varies in orientation due to the major folds on the property, and is the main fabric that outlines the folds. In most areas, S_0/S_1 dips moderately to the northwest or northeast (Fig. 3.2). The L_1 mineral lineation is sub-parallel to the major fold axes, and therefore varies in orientation only slightly. In the eastern part of the project area, L_1 is oriented on average 293°/27°. In the west, the average orientation is slightly more westerly, with a peak orientation of 282°/28° (Fig. 3.3)

Rarely, a second penetrative grain orientation fabric (S_2) cuts across S_0/S_1. This fabric occurs mainly in hinges of mesoscopic folds, and is parallel to fold axial surfaces. Two types of S_2 fabrics occur: 1) a grain shape fabric defined by flattened calcite grains in folded marble units, and 2) an incipient crenulation cleavage outlined by partial segregations of biotite and quartzo-feldspathic minerals, and by weak alignment of biotite, within folded schistose rocks.

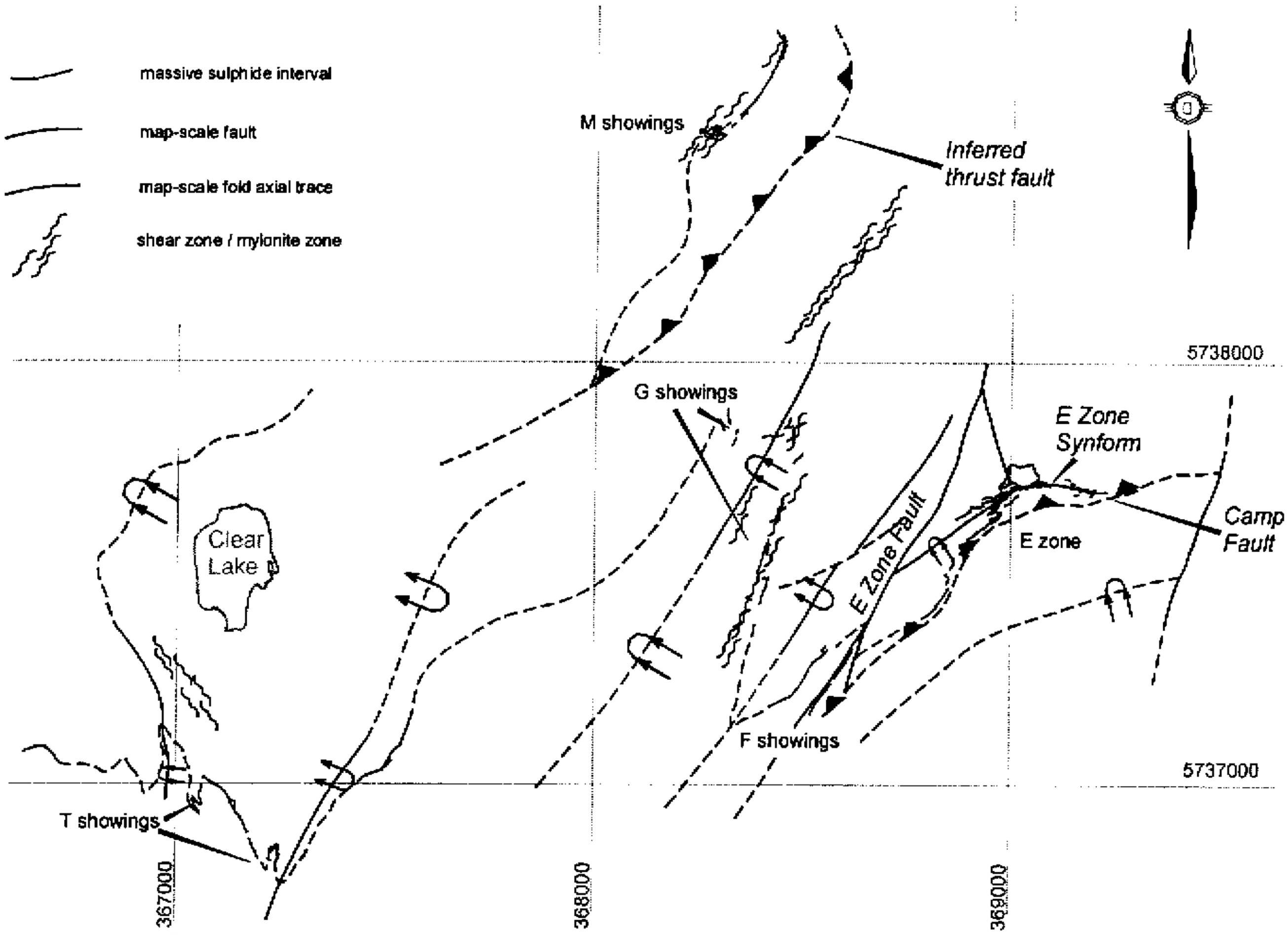


Figure 3.1: Simplified structural map of the Ruddock Creek property, showing positions of major structural features with respect to main mineral occurrences.

Rarely, a second penetrative grain orientation fabric (S_2) cuts across S_0/S_1. This fabric occurs mainly in hinges of mesoscopic folds, and is parallel to fold axial surfaces. Two types of S_2 fabrics occur: 1) a grain shape fabric defined by flattened calcite grains in folded marble units, and 2) an incipient crenulation cleavage outlined by partial segregations of biotite and quartzo-feldspathic minerals, and by weak alignment of biotite, within folded schistose rocks.

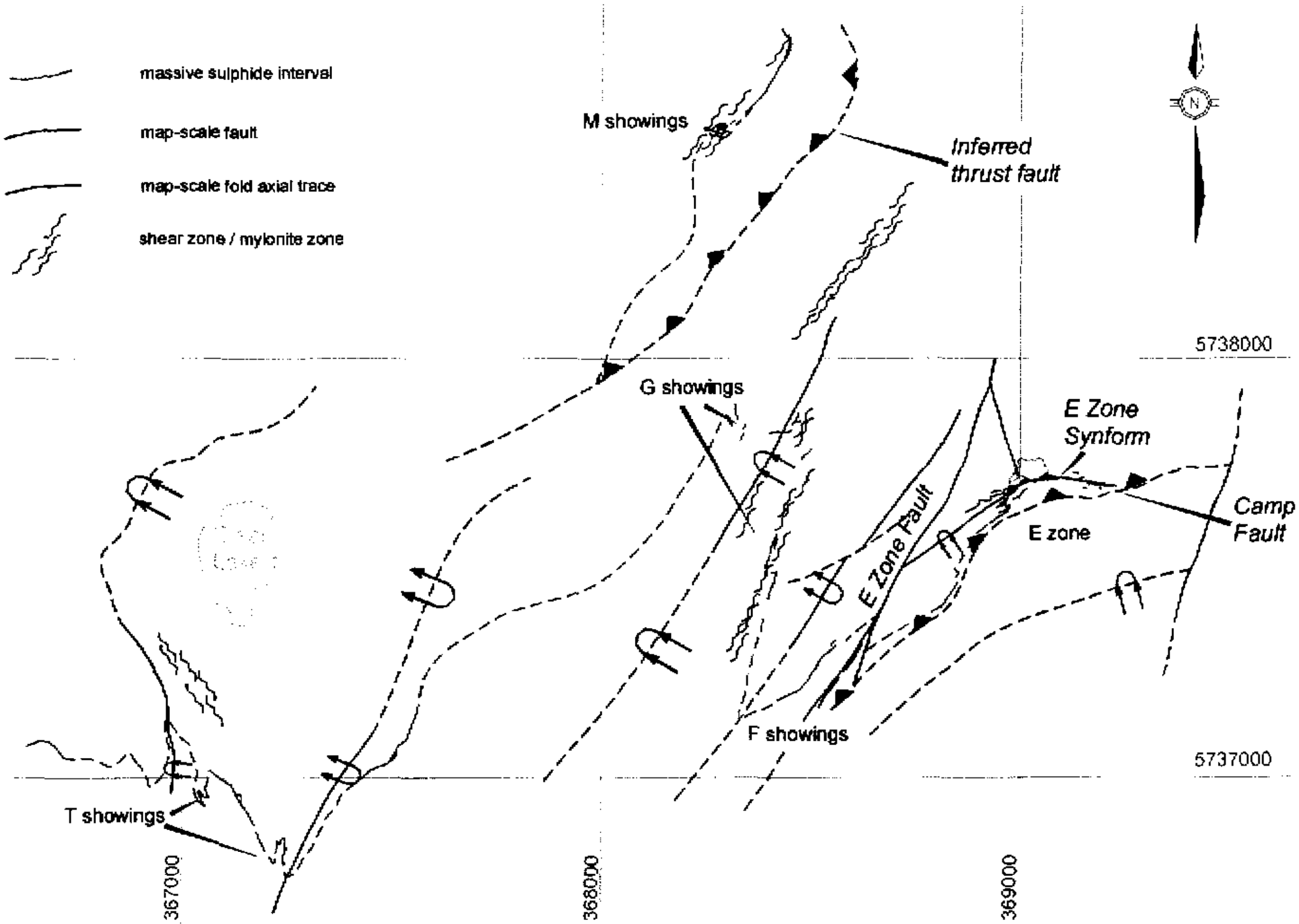
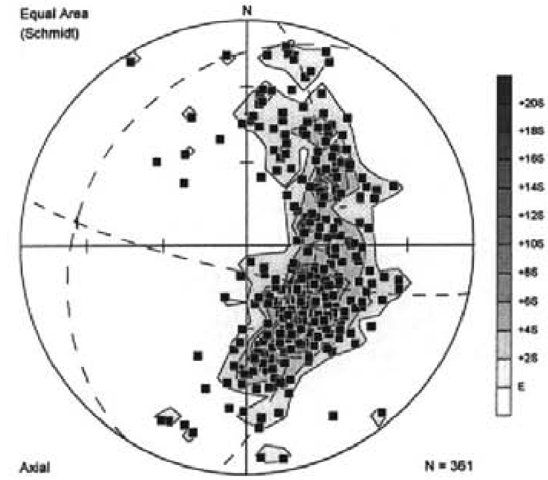
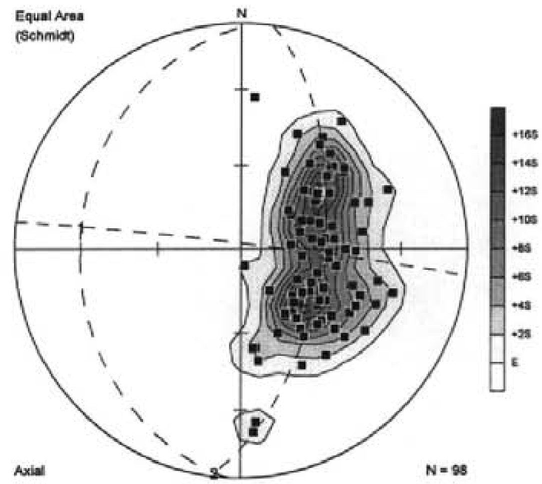


Figure 3.1: Simplified structural map of the Ruddock Creek property, showing positions of major structural features with respect to main mineral occurrences.

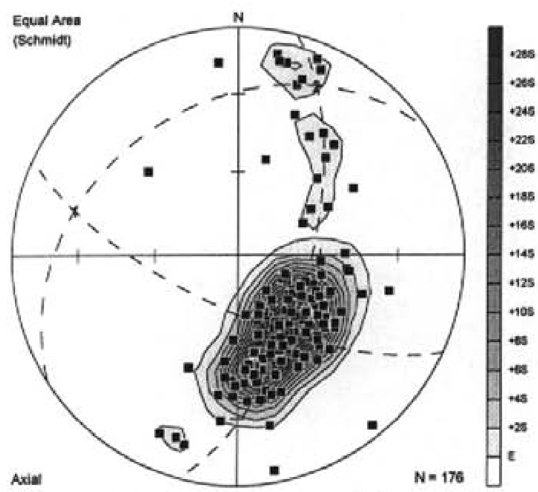
Poles to S_0/S_1



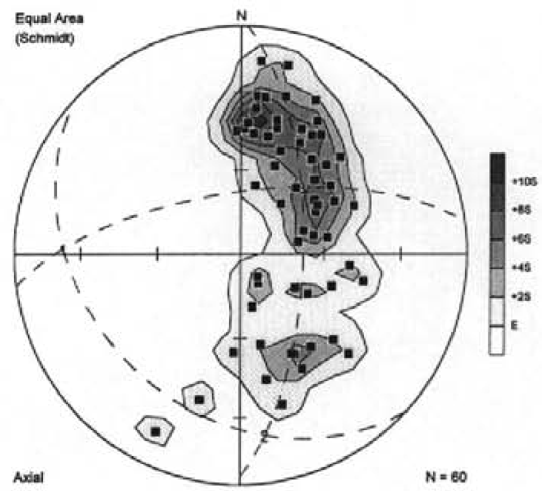
A) All areas



B) Eastern project area, west of E zone fault



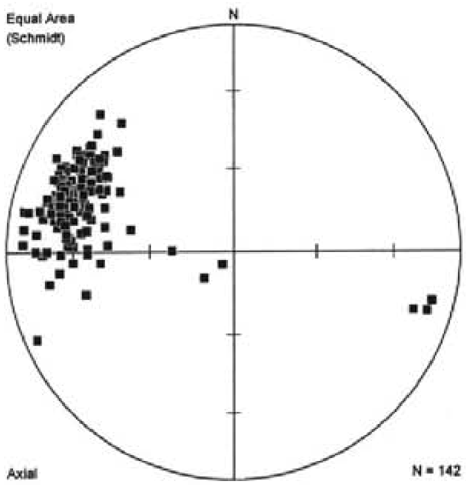
C) Eastern project area east of E zone fault



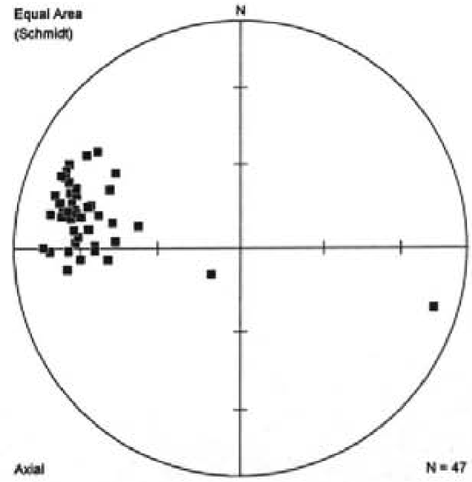
D) T showing area

Figure 3.2: Stereonet projections showing orientations of S_0/S_1 penetrative strain fabrics at Ruddock Creek: a) poles to S_0/S_1 composite foliation, entire project area; π axis to great circle distribution = 278°/25°; b) eastern part of area, hangingwall to E zone fault; π axis to great circle distribution = 278°/29°; c) eastern part of project area, footwall to E zone fault; π axis to great circle distribution = 285°/26°; d) T showing area; π axis to great circle distribution = 272°/23°.

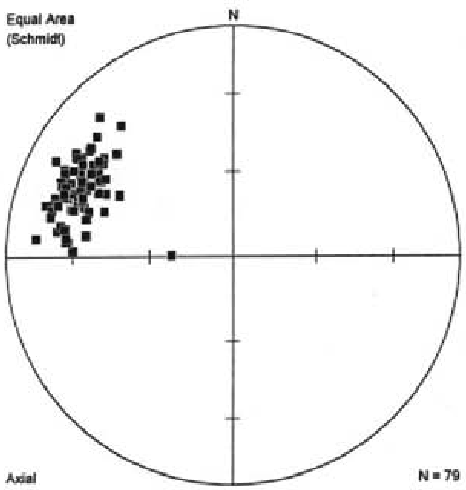
L_1 Mineral Lineations



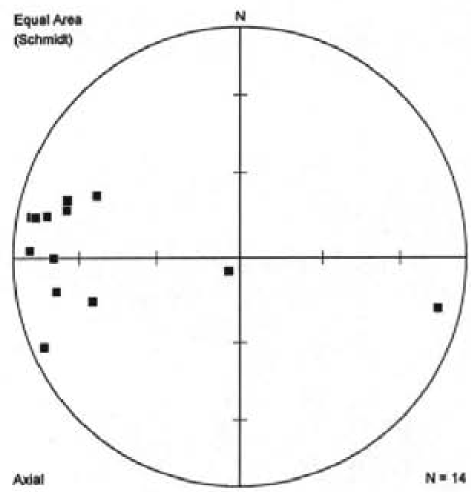
A) All areas



B) Eastern project area, west of E zone fault



C) Eastern project area east of E zone fault



D) T showing area

Figure 3.3: Stereonet projections showing orientations of L_1 mineral lineation at Ruddock Creek: a) entire project area; peak orientation = 288°/26°; b) eastern part of area, hangingwall to E zone fault; peak orientation = 282°/28°; c) eastern part of project area, footwall to E zone fault; peak orientation = 293°/27°; d) T showing area; peak orientation = 273°/19°.

Photo 3.1 (left): S_0/S_1 foliation + compositional layering in quartzo-feldspathic schist, with transposed isoclinally folded quartz vein; E zone footwall.
Photo 3.2 (right): View looking down on S_0/S_1 surface, showing L_1 lineation defined by elongate mineral aggregates; near G showing.

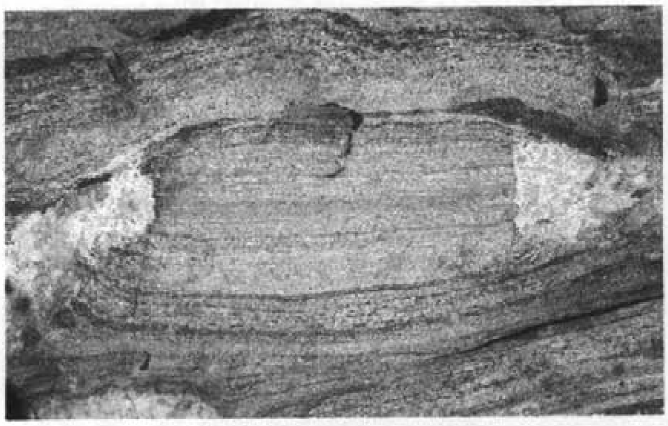
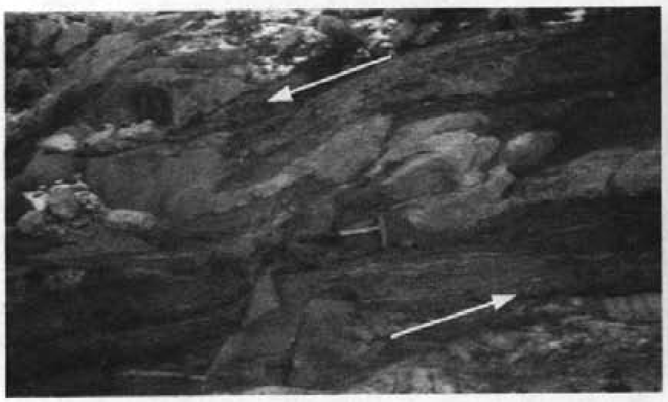


Photo 3.3: Boudinaged layer in amphibole gneiss, showing pinched boudin ends and quartz vein material between boudins; E zone hangingwall. Field of view approximately 0.3 meters.



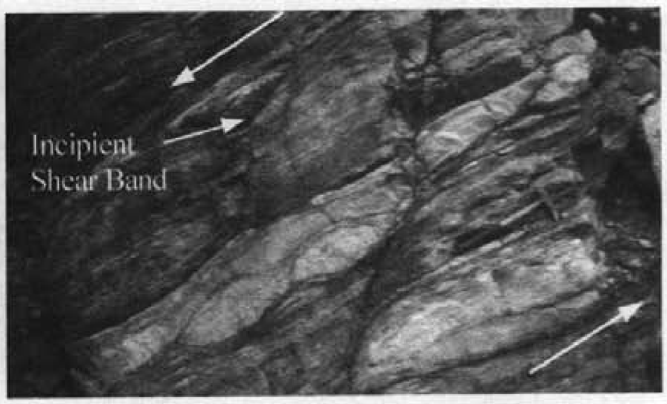


Photo 3.4 (left): Asymmetrically folded pegmatite dyke cutting biotite schist; view looking north. Fold geometry suggests top-to-west non-coaxial strain accompanied foliation development.
Photo 3.5 (right): Asymmetric boudinage of pegmatite layer in biotite schist, with incipient shear bands adjacent to contacts; view looking north. Boudin asymmetry and shear bands suggest top-to-west non-coaxial strain accompanied foliation development.

Folds

Folds in the Ruddock Creek area show large variation in style, scale, and geometry. Smallest scale folds occur in schistose units, and include both rootless intrafolial isoclines of leucocratic layers, and crenulations of the S_0/S_1 foliation. Outcrop-scale folds outlined by S_0/S_1 layering occur in all metamorphic rock types, and in most locations have tight to nearly isoclinal hinges, and asymmetric forms (Photos 3.6-3.9). Megascopic folds can be mapped using changes in S_0/S_1 orientation, lithologic distribution, and vergence reversals of mesoscopic folds, and numerous examples occur in the project area (Fig. 3.1; Map Sheet 1).

Mesoscopic fold axes consistently plunge shallowly to the west or west-northwest in all areas (Fig. 3.4). In nearly all examples, axes are parallel to the L_1 mineral elongation lineation. In rare examples where L_1 is oblique to fold axes, the angular difference is less than 5°. In much of the area mapped, fold axes plunge nearly down the dip of the axial surface, giving them reclined forms that are neither antiforms nor synforms. Great circle distributions of poles to S_0/S_1 (Fig. 3.1), reflecting the influence of megascopic folds, have π-axes coincident with mesoscopic axes and with L_1, indicating that the major folds have axes parallel to those of the mesoscopic folds.

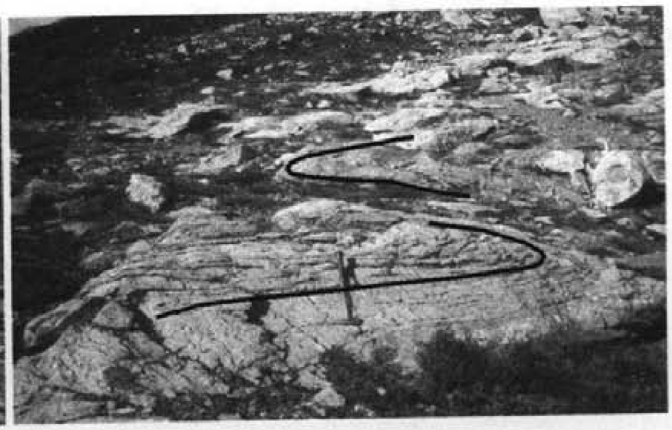
Fold axial surfaces vary in orientation across the project area. In the eastern part of the area, axial surfaces dip moderately north to north-northeast. Axial surfaces of megascopic folds further west gradually change to west-dipping, and at the T showing area, gently west-southwest dipping. This change is orientation defines a broad, open warping of early structures across the property area, possibly related to late, weak regional folding. Outcrop-scale structures equivalent to this warping are unknown.

Examples of refolded folds are rare, and those observed are limited to folded small-scale intrafolial folds in biotite schist. Nearly all folds mapped to date on the property are thus attributed to a D_2 deformation event (D_1 being responsible for formation of the S_0/S_1 fabric that outlines the folds), regardless of style.

E zone synform

Massive sulphide bodies at the E zone are interpreted to occur within a northerly-closing synformal fold, termed the E zone synform. The E zone synform is well defined by the distribution of lithologic units, by diamond drillholes that demonstrate limited downdip continuity of the mineralized zone, and by mesoscopic structural features. Minor fault movement occurred both along lithologic contacts and along the fold axial surface in the fold hinge area at the E zone. Several lines of evidence indicate that the E zone fold is of the same generation (D_2) as other megascopic folds on the property, rather than an earlier deformation event as suggested by previous workers (Fyles, 1970; Morris, 1965; Marshall, 1978):

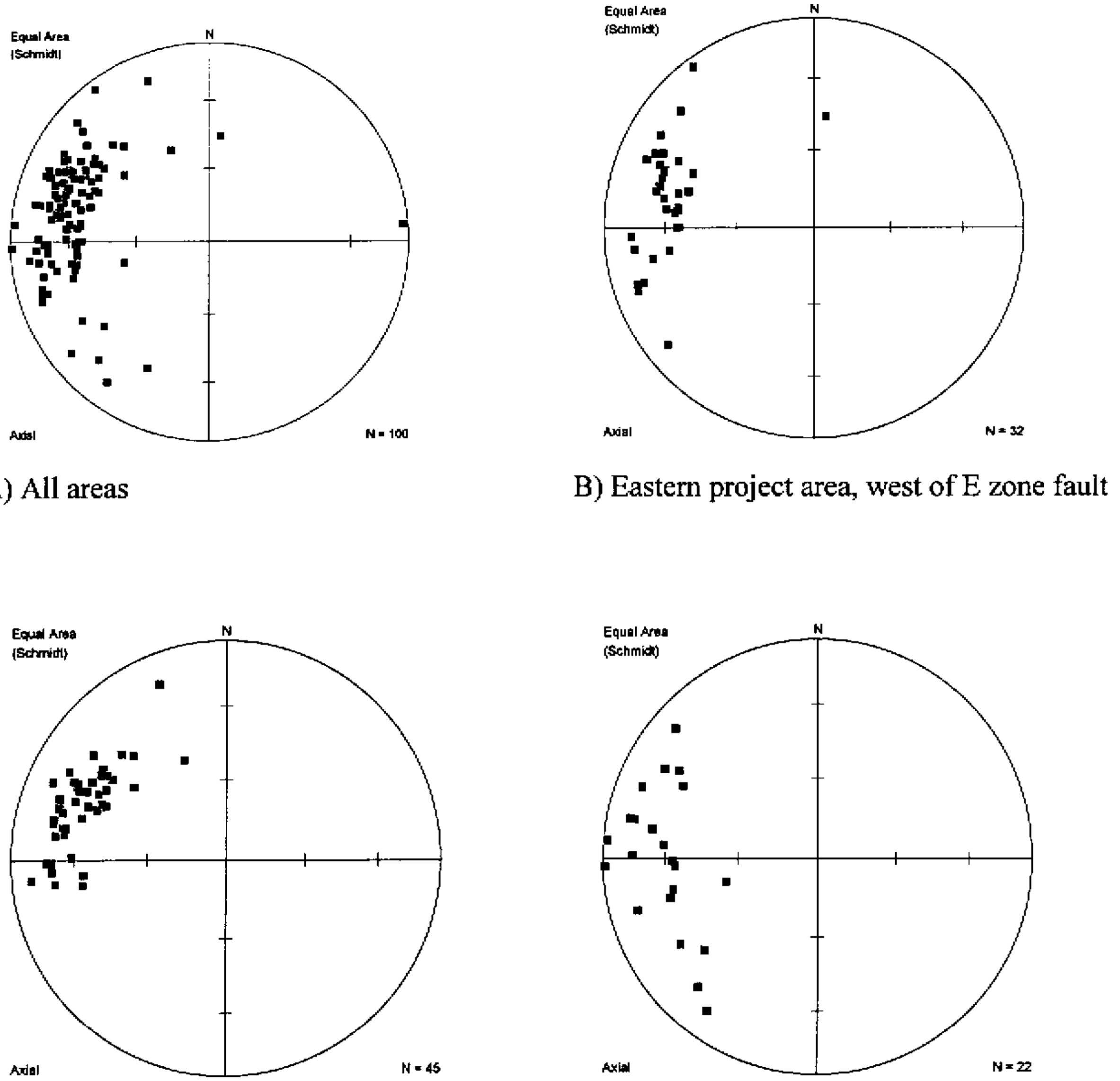
1) If the E zone synform pre-dates the major D_2 folds on the property, it is the only known example of a major earlier fold. Because it is outlined by S_0/S_1 it must post-date the S_1 foliation-forming event and the associated rootless intrafolial folds. Thus,



Examples of D_2 fold styles on Ruddock Creek Property:

Photo 3.6 (upper left): Recumbent symmetric D_2 folds outlined by compositional layering in pyroxene rich gneiss; symmetric fold geometry consistent with position in hinge of megascopic D_2 fold; T showing area.
Photo 3.7 (upper right): Recumbent S (south verging) fold pair outlined by quartzite, viewed looking to west down plunge of axis; T showing area.
Photo 3.8 (lower left): Recumbent tight fold in calc-silicate sequence outlined by marble layer, viewed looking to west down plunge of axis; east of M showing. Note hammer for scale on upper surface of marble layer.
Photo 3.9 (lower right): Tight asymmetric S (south verging) mesoscopic fold in sulphide-bearing quartzites, on lower limb of E zone synform; viewed looking to west down plunge of axis.

D_2 Fold Axes



A) All areas

B) Eastern project area, west of E zone fault

C) Eastern project area east of E zone fault

D) T showing area

Figure 3.4: Stereonet projections showing orientations of mesoscopic fold axes at Ruddock Creek: a) entire project area; peak orientation = 282°/26°; b) eastern part of area, hangingwall to E zone fault; peak orientation = 281°/26°; c) eastern part of project area, footwall to E zone fault; peak orientation = 290°/28°; d) T showing area; peak orientation = 270°/24°.

attributing the E zone synform to a separate event requires an additional phase of folding on the property for which no other evidence exists.

2) Throughout the property, outcrop-scale folds of S_0/S_1 layering have asymmetry consistent with their position relative to megascopic D_2 fold axial traces, regardless of whether their forms are nearly isoclinal or relatively open. This indicates that the outcrop-scale folds are of the same age as the megascopic folds. Similarly, at the E zone, the asymmetry of outcrop-scale folds reverses across the main fold axial surface, indicating that the major synform and the smaller-scale folds are genetically related. Unless there are two generations of mesoscopic folds on the property, this indicates that the E zone synform is a D_2 structure.

Interpretation of the E zone synform as a D_2 structure is at odds with previous interpretations that ascribed it to an earlier (D_1) event. Previous interpretations invoked property-scale fold interference patterns, with the E zone synform refolded by D_2 structures. The new interpretation simplifies the property-scale fold geometry, and implies that 1) The T showing is not the lower limb of the E zone synform as previously interpreted, and 2) the T showing and the M showing either occur at different stratigraphic levels, or they lie on different fault blocks.

Some minor folds are localized in shear zones and mylonite zones, and their formation is related to inhomogeneous shear strain within these zones, rather than regional folding events. These folds typically have highly disharmonic forms, asymmetry consistent with other kinematic indicators in the shear zone, and commonly have sheath fold forms.

Thrust faults

Previous exploration work interprets narrow zones of mylonitic fabrics that occur in several locations on the Ruddock Creek property as thrust faults. However, neither the lithologic distribution nor the kinematic indicators within these zones identified in the present study support a thrust fault interpretation.

Lithologic distribution patterns suggest that previously unrecognized faults sub-parallel to layering, potentially of thrust origin, may be present in several locations on the property. Because they are pre- to syn- metamorphic and are obscured by post-faulting pegmatites, these faults are not visible in outcrop, although the lithologic evidence for them is compelling:

1. The lithologic succession exposed on the lower (southern) limb of the E zone synform differs significantly from that exposed on the upper (northern) limb, except for the immediate hinge area. Although this difference was also noted by Marshall (1978), no attempt has been made to define a structure that could account for it. The best explanation is that a structural discontinuity, referred to here as the Camp Fault, occurs along one of the limbs, and juxtaposes the E zone synform against a different stratigraphic level. Because this fault is not

recognizable in outcrop, it is probably near layer parallel, and thus will not look significantly different from other lithologic contacts in the area. Both the property-scale distribution of lithologic units, and the pattern of vergence changes of minor folds, suggest that the fault occurs below the E zone synform, juxtaposing the calc-silicate + quartzite dominated succession containing the mineralization against structurally lower biotite schists and marbles (Map sheets 1, 2). This inferred fault likely cuts shallowly across the lower limb of the E zone fold somewhere to the southwest of the F showing, and probably formed as a thrust fault synchronous with folding. If so, the thickened fold hinge comprising the E zone mineralization should be subparallel to the fault surface, and the fault should therefore not limit the down plunge potential of the mineralization. The detailed geometry and movement direction of the fault is uncertain, and both have presumably been modified by subsequent ductile strain.

2. Additional pre- to syn- metamorphic thrust faults may occur within the sequence exposed downhill from the E zone, generating repetition of the marble units exposed there. Alternatively, this stratigraphic repetition may be related to map-scale isoclinal folds, as shown on map sheets 1 and 2.

3. Based on discontinuity of marker units, a fault is inferred to follow the axial surface of a large D_2 fold exposed between the F and G showings. Lithologic distribution indicates that the fault strikes northeasterly across a large expanse of pegmatite outcrop; its absence in these outcrops indicates that it is pre-pegmatite in age, and likely formed synchronous with folding.

4. The sulphide-bearing interval at the M showing, traced to the southwest by previous workers to the U, V, and Q showings, does not appear to be continuous with other sulphide occurrences (E, F, T, G) in the eastern project area. The two groups of showings may lie on separate fault slices, separated by a previously unrecognized fault sub-parallel to layering (Map sheets 1, 2; Fig. 3.1).

Mylonite zones / shear zones

In most of the project area, the dominant ductile strain fabrics show little or no structural asymmetry, indicating that they formed under nearly coaxial strain conditions (i.e., flattening and elongation with no shearing). Exceptions are narrow localized mylonite zones, and a broader zone of shearing identified near the T showings.

Narrow zones of mylonitic and ultramylonitic rock fabrics (Photo 3.10) occur west of the E zone, including those spatially associated with mineralization at the F, G, and M showings. Mylonitic foliation in these zones dips moderately westward, and contains a westerly-plunging mylonitic lineation. These fabrics are parallel to and continuous with S_0/S_1 foliation and L_1 lineation in adjacent rocks (Fig. 3.5), from which they can be distinguished by the intense grain-size reduction, fine tectonic lamination, and presence of shear strain indicators absent from the regional fabrics. Along strike, the mylonites widen into diffuse shear zones, and eventually dissipate into areas lacking shear fabrics.

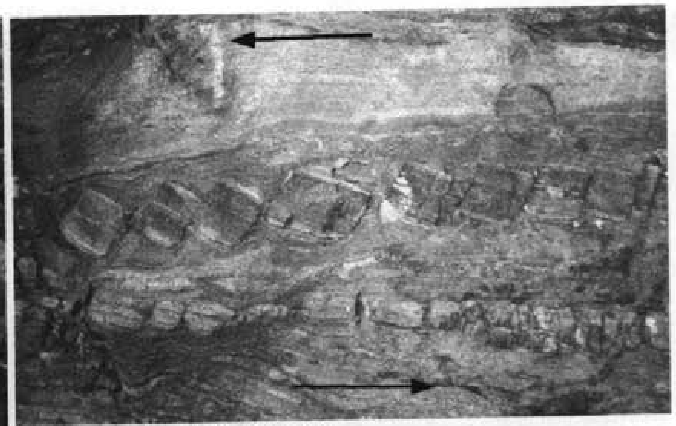



Photo 3.9 (left): Finely-laminated, siliceous ultramylonite; lower G showing.
Photo 3.10 (right): Calc-silicate gneiss in shear zone, with boudins of competent amphibolitic layer showing rotation indicating top-to-west transport; viewed looking North; outcrop east of M showing.

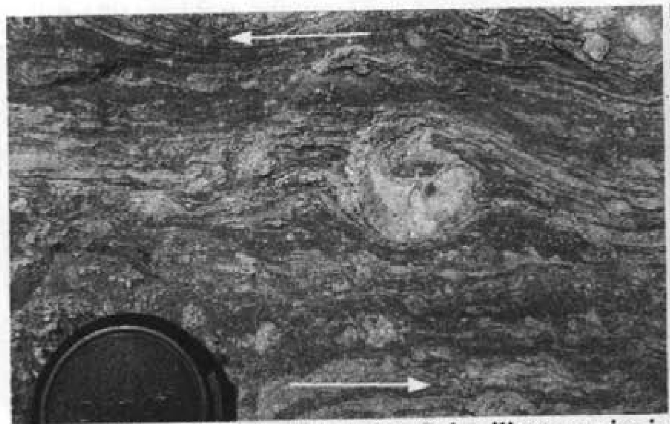



Photo 3.11 (middle left): Calc-silicate gneiss in shear zone, with boudin of feldspathic layer showing counterclockwise rotation indicating top-to-west transport; viewed looking North; outcrop east of M showing.
Photo 3.12 (middle right): Highly disharmonic sheath folds in shear zone forming footwall to M showing; field of view approximately 2 metres horizontally.

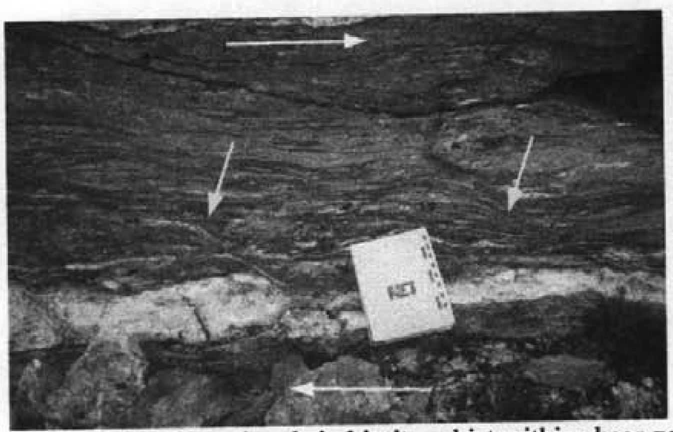


Photo 3.13: Shear bands in biotite schist within shear zone north of T showings; view looking to west; shear band geometry indicates north-directed shear.

Kinematic indicators in the mylonite and shear zones (S/C fabrics, rotated boudins, rolled porphyroclasts, sheath folds) clearly indicate extensional (top-to-west) shearing, in contrast to their previous thrust interpretations (Photos 3.11 – 3.13).

In the T showing area, a series of tight megascopic folds structurally overlie a broad south-dipping zone of biotite schist containing shear fabrics such as ductile faults, asymmetric boudins, probable sheath folds, and shear bands (Map sheet 1). These fabrics indicate northerly-directed transport within the zone, which may be the result of structural thickening during folding.

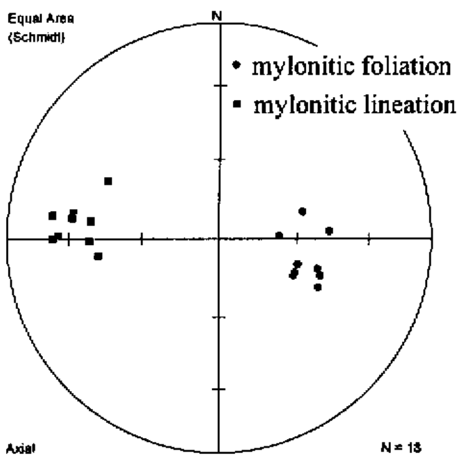


Figure 3.5: Stereonet projection showing mylonitic lineation and poles to mylonitic foliation for all mylonite zones.

E zone fault and other brittle faults

Air photographs of the Ruddock Creek project area show strongly-defined linear topographic breaks in two dominant orientations: northnorthwest, and northnortheast. Although these topographic breaks are clearly visible in the field (photo 3.14), lithologic contacts can be traced across them without discernible offset, and with one exception, they are not shown as faults in this report. The only major late brittle faults mapped in the present study are the north-northeast-striking E zone fault, and a parallel fault approximately 800 metres to the east. Both of these structures significantly affect the distribution of lithologic units and massive sulphide occurrences.

The eastern fault coincides with a break in topography, and although it is not directly exposed, its trace can be inferred with confidence for a strike length of over 300 metres. Offset is uncertain; along its southern portion, lithologic contacts show about 20 metres apparent sinistral strike separation, however, to the north, correlation of contacts across the fault is more problematic.

Several lines of evidence indicate that the E zone fault is a significant property-scale structural discontinuity:

1) In the E zone area, zenoliths within the pegmatite west of the fault consist mainly of mafic, pyroxene-rich gneisses. These gneisses occur at a higher structural level than the calc-silicate succession that overlies the E zone on the adjacent east side of the fault.

2) A major D_2 fold axial trace located west of the fault is truncated by the fault, and its continuation east of the fault has not been identified. This fold is not the offset equivalent to the E zone synform, as it closes in the opposite direction.

3) The mineralized interval occurs at different positions on the two sides of the fault.

Much of the northern portion of the E zone fault was inaccessible during the 2000 field season due to thick snow cover. Much of the outcrop west of the fault in this area is pegmatite, making identification of comparable marker units on the two sides of the fault difficult.

Best exposures for interpreting fault kinematics are at lower elevations, in the area of the F showings. Here, the fault splits into two strands (Map sheet 1): an eastern strand that follows the main drainage east of the lower F showing, and a western strand that follows the break in slope and secondary drainage separating the upper and lower F showings. Anastamosing fractures and narrow (< 1 metre) cataclastic zones are well developed in the creekbed followed by the eastern strand; the zone of fracturing strikes on average 020° and dips steeply (70° - 80°) eastward. This dip opposes that of the main fault surface, suggesting that the zone is an antithetic secondary fault surface. Fault grooves and slickensides on fault surfaces suggest that the overall sense of movement in this zone is dominantly dipslip.

The western strand of the fault is partially exposed adjacent to the southern limit of the lower F showing, as a set of fractures/minor faults along a pegmatite / biotite schist contact. These surfaces strike roughly 210° and dip moderately to steeply to the west. Striae on the fault surfaces, and geometry of adjacent minor fault surfaces (Riedel type secondary faults, photo 3.15) indicate west-side-down movement (Fig. 3.6).

Secondary fault and fault striae orientations in outcrops adjacent to the E zone fault were analyzed using stress inversion analysis (Angelier, 1984) to determine the possible stress state during faulting. This method assumes that 1) all fault / fault striae pairs represent the same period of deformation, and 2) movement direction of each fault is independent of that on adjacent faults that it may intersect, and is therefore parallel to the direction of maximum shear stress on the fault surface. Although these assumptions are rarely met in real geological environments, stress inversion analysis commonly produces results in agreement with other structural data, and therefore gives a reasonable estimate of stress states.

The stress state determined for the secondary fault data indicates a minimum (tensile) principal stress axis plunging gently to the westnorthwest, and a sub-horizontal, north-south maximum compressive stress axis (Fig. 3.6). If the E zone fault itself were active in this stress regime, it would have dominantly dip-slip movement.

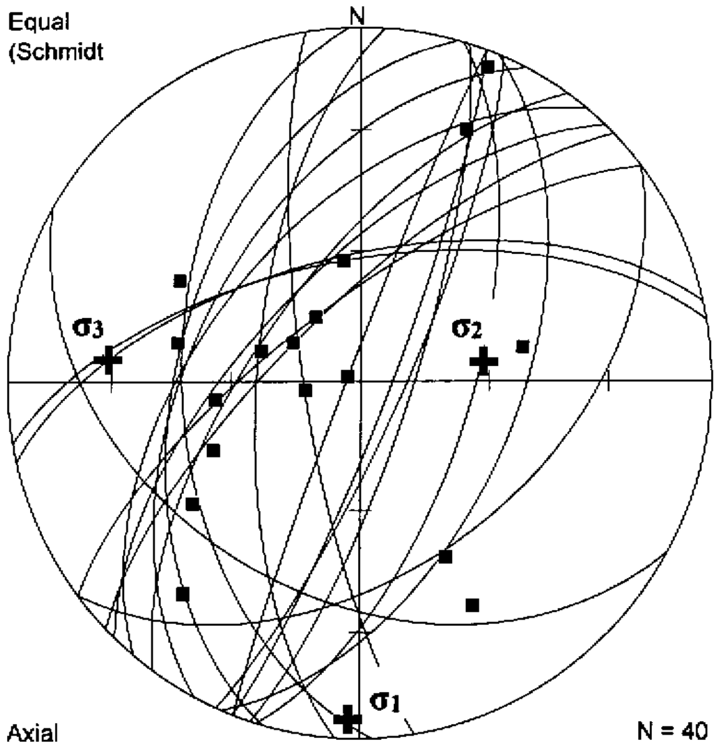


Figure 3.6: Secondary fault data for structures adjacent to the E zone fault near the F showing. Great circles = secondary fault surfaces, squares = slickenside striae. Principal stress axes shown were determined using stress inversion analysis of fault data.

Summary of deformation events

The structural features described above at the Ruddock Creek project area are most consistent with a structural history of three main ductile phases, with minor late brittle faulting. Earlier phases of deformation cannot be disproved, but if present, structures associated with them have been completely overprinted by younger strain and metamorphic events.

Early, regional foliation forming event (D_1)

D_1 is a regional, synmetamorphic deformation during which the primary S_0/S_1 fabric initially formed. Early veins, which probably formed during D_1 as extensional hydraulic fractures, were subsequently transposed into the foliation plane, resulting in the rootless intrafolial isoclines found in the schistose parts of the sequence. Rare rootless isoclines outlined by compositional layering are also ascribed to D_1. No regional D_1 structures have been identified on the property.

D_2 folding and thrusting

Nearly all folds on the property are outlined by the S_0/S_1 foliation, and are accordingly assigned to a D_2 deformation event. D_2 generated a variety of fold styles, dependent on scale, lithology, and structural depth. Principal folds are the megascopic folds of layering that cross the property in a northwesterly direction. These range from near isoclinal, such as the E zone fold, to relatively open forms, such as the fold at the T showing. As noted by previous workers (Marshall, 1978), fold forms become progressively tighter eastward across the property.

With few exceptions, minor fold asymmetry is appropriate with respect to position on major D_2 folds, and therefore mesoscopic folds formed during D_2 deformation. Minor fold asymmetry is useful for determining locations of major fold axial traces, particularly in the eastern part of the property where megascopic folds are near isoclinal and faults cut across megascopic folds.

D_3 ductile extension

Tertiary east-west extension is well documented regionally near Ruddock Creek, and the present form of structural features on the property almost certainly reflects modification during this event. East-west ductile stretching would have re-oriented pre-existing structure fabrics, resulting in fold axes near parallel to mineral elongation lineations and tighter folds than their original forms. The stretching appears slightly more intense in the eastern part of the property than in the west, possibly attributable to deeper structural levels in the east, and might in part contribute to the tighter fold forms present there. West-dipping mylonites with west-side-down kinematics probably formed during D_3 ductile extension.

Late brittle faulting

Late brittle faulting at Ruddock Creek is manifest in two orientations of faults: north-northeast-striking, moderately to steeply west-dipping, as typified by the E zone fault, and north-northwest-striking, with steep dips. These faults may have formed during the latest stages of Tertiary extension, as crustal thinning and exhumation during earlier stages contributed to cooling and a corresponding more brittle environment of deformation.

Photo 3.14: View looking northward of portion of project area east of the E zone, showing NNE and NNW trending topographic breaks; the marked break corresponds to fault mapped 800 metres east of E zone.

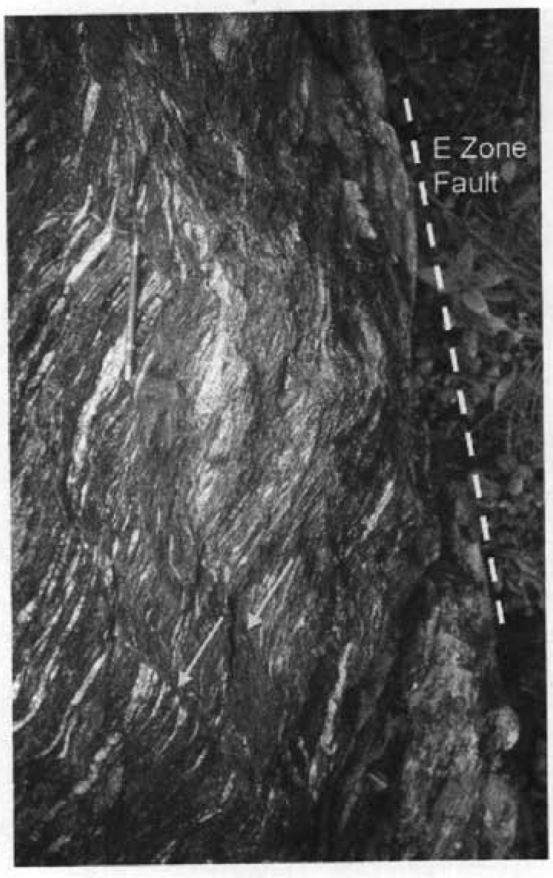


Photo 3.15: Outcrop adjacent to E zone fault, showing Riedel fractures (arrows) indicating west-side-down displacement; subvertical outcrop surface viewed looking north.

4. Structural Characteristics of Mineral Occurrences

E zone

The E zone has received by far the most detailed exploration of the known mineral showings on the Ruddock Creek property, including calculation of a preliminary resource based on nearly 40 diamond drillholes. Detailed descriptions, surface maps, cross sections, and drillhole logs are included in previous reports (e.g., Morris, 1965). Rather than duplicate this detailed descriptive work, this study focused on evaluating the structural history of the E zone area, to assist in identifying new drill targets.

Primary thickening vs. structural thickening
Massive sulphide mineralization in the E zone forms a gently to moderately west-plunging elongate body localized within the hinge of the E zone synform. Drillhole data indicate that the fold hinge is slightly curvilinear, although not to the extent that presented difficulties in previous drill programs. Sulphides occur at two levels: a thicker layer on the inside of the synform, and a thinner layer on the outside of the synform. Previous workers have debated whether the anomalously thick sulphide lens at the E zone is a primary stratigraphic feature, or is related to secondary structural thickening (e.g., Marshall, 1978). Without doubt some of the thickening is related to doubling of the sulphide zone in the hinge, but the fold may also coincide with a zone of greater primary thickness. The occurrence of massive sulphides in multiple lithologically distinct layers at the E zone lends support to primary thickening in the area. If the E zone represents an area of primary thickening, the unusually amphibole-rich gneisses that occur to the north of the mineralized outcrops may represent a metamorphosed alteration zone in the stratigraphic footwall to the deposit. It is unlikely that the massive sulphide itself would represent a large enough mechanical discontinuity to nucleate folds on the scale of the E zone synform. However, the combined effect of the anomalously thick massive sulphide layers, wall rock alteration, and possible underlying basement faults may together have localized folding.

Deep E zone extensions
Previous drillhole data were combined with new structural data to evaluate the down-plunge potential of mineralization localized in the E zone synformal hinge (Map sheet 3). This evaluation is based on the premise that the hinge should continue in the subsurface to the point where it is cut by the E zone fault, and the offset portion should occur to the west in the hangingwall of the E zone fault. A similar exercise was completed by Falconbridge (Morris, 1965); the only difference in the present study is that two additional deep drillholes have been completed.

1. E zone Fault:
The orientation of the E zone fault was determined using fault intersections in drillholes ED-1, ED-2, ED-3, E-28, and two well-constrained reference points on the surface (reference points 1, 2 on map sheet 3). The best fit to these data points is a slightly curviplanar fault, oriented 187°/61° in the northern part of the area, and 198°/61° in the south.

2. Footwall limits to mineralization:
Limits to mineralization in the footwall (east) block of the E zone fault are defined by the synformal fold hinge, and the intersection line between the mineralized interval and the E zone fault. The hinge line projection shown on map sheet 3 is drawn using both drillhole intersections and average fold axis orientations measured in the field. The intersection line that limits mineralization to the west is constructed using the average limb orientations, the local fault orientation, and the positions of fault cutoffs of mineralization on the surface. Mineralization is open updip to the surface trace of the mineralized zone; however, previous drilling demonstrates that the thick massive sulphide bodies occur within 50-75 metres of the hinge.

3. Hangingwall limits to mineralization:
Four deep drillholes constrain the position of mineralization in the hangingwall to the E zone fault: C-76-1; ED-7, ED-8, and C-75-1. Projection of drillhole data into a cross section through the hangingwall block (section C-C' on Map sheet 2) indicates that mineralization encountered in drillhole C-75-1 is at a position compatible with the downdip projection of the upper F zone. The absence of a lower mineralized interval in this hole, combined with only minor mineralization in drillhole ED-7, and no mineralization in drillhole C-76-1A, can be interpreted to indicate that the synform hinge is located just north of the intersection in drillhole C-75-1. The surface projection of this hinge is shown on map sheet 3, based on these drillhole intersections and on average orientations of fold hinges in outcrop.

The average orientation of the upper fold limb was determined to be 231°/33°, using a best fit of the drillhole intersections, the hinge line orientation, and the outcrop trace of mineralization in the upper F zone. Insufficient data are available to determine the orientation of the lower limb. Structure contours constructed using the upper limb orientation predict that the massive sulphide zone should be intersected at an elevation of around 1800 metres in drillhole ED-4, about 30 metres higher than mineralization was actually encountered. However, the hole was terminated at almost exactly the projected depth of the limb, and the mineralization encountered in the hole may be above the main mineralized layer. Limits to mineralization shown on map sheet 3 were constructed using the above limb orientation to determine the position of the intersection with the E zone fault.

The intersection of the synformal fold hinge with the E zone fault provides a convenient marker for calculating fault displacement. Based on the above analysis, the net slip direction is 291°/54° (normal dip-slip, with a small dextral component), and the magnitude of net slip is 299 metres.

Drillholes ED-1, ED-2, and ED-3 were all drilled in the gap where mineralization is cut out by the E zone fault, and all failed to intersect mineralization.

Map sheet 3 identifies several large zones of potential mineralization that are either incompletely tested or completely untested. Nearly half of the hinge zone in the footwall block is untested. At its deepest point, this block is less than 300 metres vertically below the surface.

Except for the intersection in drillhole C-75-1, the hangingwall block is untested. At its shallowest level, the hinge is just over 500 metres vertically below the surface, and it gradually increases in depth to the west. The westernmost point shown on map sheet 3, about 250 metres west of the collar of drillhole ED-7, is about 700 metres vertically below the surface.

F showing

The F showing consists of two sub-parallel intervals of massive and disseminated sulphides, along strike to the southwest of the E zone. The sulphides occur within a sequence of calc-silicate gneiss and quartzo-feldspathic schist, enveloped within granitic pegmatite (Map sheet 1). Narrow, discontinuous mylonitic zones occur just above the massive sulphides in the upper F showing. The massive sulphide layers themselves are planar and continuous (photo 4.1), and can even be traced as isolated oxidized pods through the pegmatite.

The massive sulphides of the upper and lower F showings have previously been interpreted as the along-strike extensions of the two limbs of the E zone synform. A reversal in the asymmetry of minor D_2 folds between the showings supports this interpretation. Present mapping indicates that a strand of the E zone fault passes between the upper and lower F showings. Oblique dextral / west-side-down offset on the fault results in the close juxtaposition of the two fold limbs at the F showing.

G showing

The G showing consists of isolated massive sulphide lenses in outcrops scattered over a strike length of about 500 metres. Most of the outcrops surrounding the G showings consist of pegmatite, but zenoliths present to the east of the zone are dominantly calc-silicate and marble, whereas to the west mica schists are dominant. In the southern G showings, the massive sulphides are closely spatially associated with siliceous mylonites, which occur both above and below the sulphide zone. Here, S_0/S_1 layering dips moderately to the west, except for short limbs of minor folds. In the northern G showings, the positions of the sulphide layers are less predictable. Pegmatite is abundant, and folding has resulted in layer orientations discordant to those in nearby outcrops (Photo 4.2). Folding at the upper G showings may be the along-trend extension of a zone of tight folding and mylonitic fabrics located several hundred metres to the northeast (Map sheet 1).

M showing

The M showing is exposed only on a few nunataks, so its structural and stratigraphic position is poorly defined. The main (upper) M showing occurs as a near dip-slope (Photo 4.3), and minor folding results in a complex sulphide distribution on the outcrop surface. Both the sulphide layer and underlying quartzose calc-silicate rocks show evidence of intense strain, including mylonitic fabrics, durchbewegung texture (Photo 4.4), and abundant sheath folds. These features indicate west-side-down movement concentrated within and adjacent to the moderately southwest-dipping mineralized interval, likely during Tertiary extension.

The mineralized interval can be traced northward from the nunataks into a high pass, and its orientation where last mapped is consistent with correlation with the U, V, R, and Q showings as indicated by previous workers.

T showing

The T showing encompasses three main areas of mineralization. The three areas occur near the axis of a major D_2 fold, with the upper and middle zones located on the south-dipping limb and the lower showing located on the northwest-dipping limb. The upper T showing consists of several lenses of massive sulphide, the largest of which is nearly a metre thick, surviving as zenoliths within pegmatite. Orientation of layering within these lenses, and their distribution with respect to one another, indicates that they occur in an area of tight megascopic folds with S asymmetry. The middle T showing is structurally similar to the upper T. There is less pegmatite at the middle T showing, and layering (including massive sulphide) can be traced around several S folds. Fold asymmetry at the upper and middle zones is consistent with position on the major D_2 structure.

At the lower T showing, folding is relatively minor, and the massive sulphide occurs along a relatively planar limb.


Photo 4.1 (left): Upper F showings: massive sulphide layer approximately 0.5 metre thick, sandwiched between pegmatite hangingwall and calc-silicate footwall.
Photo 4.2 (right): Upper G showings: discontinuous massive sulphide lenses overlying calc-silicate footwall


Photo 4.3 (left): M showing: geologist standing on massive sulphide layer forming dip-slope surface of nunatak.
Photo 4.4 (right): M showing: durchbewegung texture consisting of fine-grained massive sulphide enclosing cataclastic fragments of felsic gneiss and clear quartz.

5. Exploration Implications and Recommendations

1. Analysis of small-scale structures adjacent to the trace of the E zone fault support a normal net slip, similar to previous interpretations. Projecting fault and fold geometry into the subsurface defines a large, virtually unexplored prospective zone in the subsurface where the E zone synform hinge may contain thickened massive sulphides similar to those exposed at or near surface in the E zone.

2. Because the E zone fold has been re-interpreted as a D_2 fold, the same generation as the other megascopic folds on the property, the refolded fold patterns envisaged by previous workers are no longer valid. The most significant implication of this change is that the T showing is no longer correlated with the lower limb of the E zone fold. This eliminates the unrealistic fold geometry that previous interpretations employed to accomplish this correlation (specifically, section E on Plate 76-3). The conceptual (but highly speculative) fold hinge targets along the lower limb between the E zone and T showing no longer exist.

3. The inferred thrust fault that has been interpreted just south of the E zone likely formed during D_2 folding. The most probable fold / fault geometry is one in which the hinge line of the synform lies within the fault plane. The thrust fault will therefore not cut the E zone mineralization in the subsurface, and will not present difficulties in targeting down-plunge mineralization.

4. The mineralized interval should occur in the footwall of the inferred thrust below the E zone. It has not been identified within the part of this area mapped. Gossanous outcrops exposed beneath glaciers to the south of this pass may be stratigraphically equivalent to the sulphide bearing interval at the known occurrences.

5. The M showing, and by inference, the U, V, Q, and R showings, may occur at the same stratigraphic interval of the other showings, but they are at a higher structural level. Therefore, a thrust fault may lie within the pegmatite-dominated rocks between the two groups of massive sulphide occurrences. Because most thrust faults in the area are pre- to syn-metamorphic, it will be difficult to locate this structure.

6. The great thickness of the sulphide layer at the E zone is largely a result of sulphide redistribution during folding, but may in part reflect a greater primary accumulation of sulphides. Amphibole gneisses in the hangingwall to the E zone, which thin rapidly away from the E zone, may be the metamorphosed equivalents of altered rocks localized near the thickest sulphide zones, and may be a useful to assess the exploration potential of other massive sulphide occurrences on the property.

7. The volume of pegmatite increases rapidly on surface westward from the E zone surface showing. However, at the inferred depth of the mineralized zone west of the E zone fault, previous deep drillholes encountered less than 50% pegmatite. Therefore, volume of pegmatite at surface is a poor guide to deeper levels, and exploration for

down-plunge extensions to mineralization should not be discouraged by the abundance of intrusive rock on surface.

Recommendations

1. The present study has established a geological framework for the Ruddock Creek Property on which future exploration and definition drilling can be based. The next phase of exploration on the property should contain a large component of diamond drilling of targets in the E zone, complemented by mapping of parts of the property not included in this study.

2. The down-plunge extension of the E zone mineralization remains the best-defined and highest priority exploration target on the Ruddock Creek Property. This extension on the footwall block of the E zone fault can be tested with two fences of drillholes, and the hangingwall block with several well-placed drillholes (Map Sheet 3). These hangingwall holes should target the projection of the mineralized zone well south of the poorly constrained inferred hinge position (50-75 metres minimum). The E zone holes should be drilled in a general progression from east to west, as the results of the more easterly holes may dictate the placement of the deeper, westerly holes

3. Core from previous drilling campaigns should be rehabilitated in those holes where the boxes have not deteriorated.

4. New drillholes should be logged using the system of lithologic units defined in the present study and used on the latest maps. Recoverable drillcore from previous programs should be examined to evaluate the quality of previous logging, and to determine if the lithologic units defined in the existing drill logs can be directly converted to the new lithologic designations.

5. Provided that the amount of work required is not too great, existing digital data should be converted to metric units of measurement.

6. 1:5000 scale mapping completed in this study should be extended to cover the remaining property. Particular care must be taken to record structural features, especially outcrop-scale folds, which were of great import in defining some of the map-scale structures in the present study.

7. If economical, the existing detailed topographic base maps should be converted to digital format for use in upcoming mapping programs and computer data bases.

8. Reconnaissance visits should be made to the more prospective looking nearby areas, particularly where recent glacial retreat has exposed gossanous outcrops. In addition to sampling of mineralized outcrops, these visits should examine the stratigraphic succession present in these areas for similarities to that at the E zone.

9. Structural thickening of suphide layers may occur in any of the major D_2 fold hinges on the property; however, fold hinges that coincide with favourable stratigraphic characteristics (rapid facies changes suggesting depositional subbasins; possible metamorphosed alteration zones) will have greatest exploration potential. To date, these stratigraphic characteristics have not been identified at any of the major fold hinges outside of the E zone.

REFERENCES:

Angelier, J., 1984. Tectonic analysis of fault slip data sets. Journal of Geophysical Research, v. 89, p. 5835-5848

Fyles, J.T., 1970. The Jordan River Area near Revelstoke British Columbia, A preliminary study of lead zinc deposits in the Shuswap Metamorphic Complex. B.C. Department of Mines and Petroleum Resources, Bulletin 57.

Marshall, B., 1978. Structural Investigations of the Ruddock Creek Property. Internal consulting report prepared for Cominco Ltd., September, 1978.

Mawer, A.B., 1976. Ruddock Creek Termination Report 1976; Internal document prepared by Cominco Exploration Ltd., November 30, 1976.

Morris, H.R., 1965. Report on Ruddock Creek Lead-Zinc Property, 1961 to 1963. Internal report prepared for Falconbridge Nickel Mines Ltd., March 12, 1965

STATEMENT OF QUALIFICATIONS

I, **PETER D. LEWIS** HEREBY CERTIFY THAT:

1. I AM A CONSULTING GEOLOGIST WITH AN OFFICE AT 15715 MOUNTAINVIEW DRIVE, SURREY, BRITISH COLUMBIA, V4P 2W9.

2. I AM A GRADUATE OF STANFORD UNIVERSITY (B.SC., 1984, GEOLOGICAL SCIENCES) AND THE UNIVERSITY OF BRITISH COLUMBIA (M.SC., GEOLOGICAL SCIENCES, 1987; PH.D., GEOLOGICAL SCIENCES, 1991).

3. I HAVE PRACTICED MY PROFESSION AS A GEOLOGIST CONTINUOUSLY FOR MORE THAN FIFTEEN YEARS AS A RESEARCHER AND AS A STRUCTURAL GEOLOGY CONSULTANT TO THE MINERAL EXPLORATION INDUSTRY.

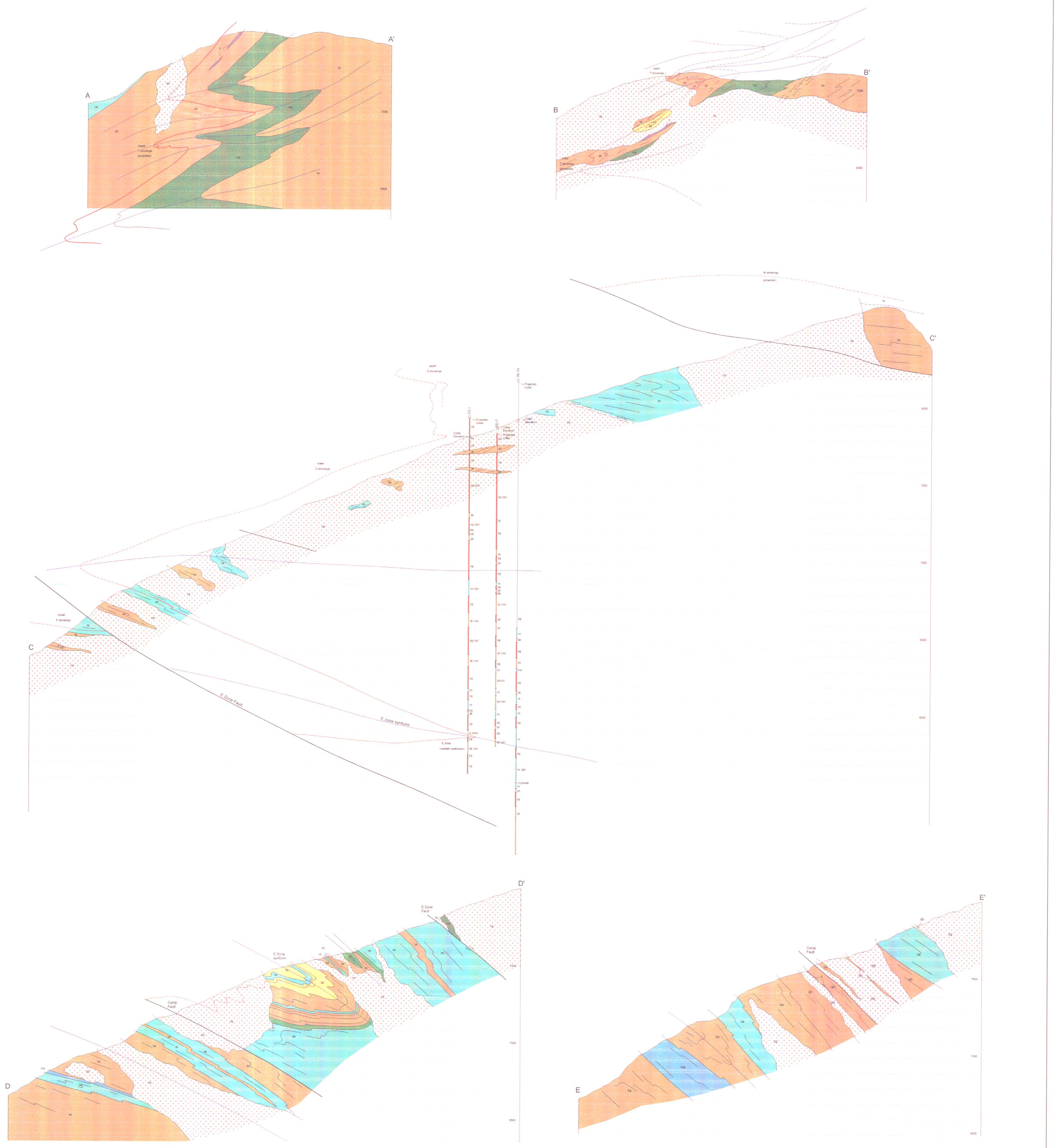
4. I AM REGISTERED AS A PROFESSIONAL GEOSCIENTIST IN THE PROVINCE OF BRITISH COLUMBIA, AND AM A MEMBER OF THE SOCIETY OF ECONOMIC GEOLOGISTS AND THE INTERNATIONAL ASSOCIATION OF STRUCTURAL AND TECTONIC GEOLOGISTS.

5. THIS REPORT IS BASED ON GEOLOGICAL STUDIES CONDUCTED BY MYSELF OR UNDER MY SUPERVISION, AND A REVIEW OF DATA AVAILABLE TO THE GENERAL PUBLIC OR PROVIDED TO MYSELF BY DOUBLESTAR RESOURCES LTD.

6. I HAVE NO DIRECT, INDIRECT, OR CONTINGENT INTEREST IN EITHER DOUBLESTAR RESOURCES LTD. OR ANY OF THE PROPERTY DESCRIBED IN THIS REPORT, OR IN OTHER MINING PROPERTIES IN THE REGION.

	5 Jan 2001
Peter D. Lewis, Ph.D., P. Geo.	**Date**

mg Mafic (pyroxene, amphibole) gneiss
cs Calc-silicate gneiss, marble
ma Marble
ag Amphibole gneiss
qb Quartzo-feldspathic biotite schist
qz Quarzite, quartzose schist
bs Biotite schist
tr Massive tremolite/actinolite
pg Pegmatite/granite
Massive sulphide (exposed, projected)
Massive sulphide copied from Morris (1965)
snowfield
outcrop / outcrop area limit
lithologic contact (defined, approximate, inferred)
megascopic fault (defined, approximate, inferred)
megascopic fold axial trace (defined, inferred)
symbols: reclined north closing, reclined south closing
shear zone
limit of mapping
Penetrative Fabrics
S1 foliation / compositional layering
S1 foliation, no visible compositional layering
S1/S2 foliation
S2 foliation
L1 mineral elongation lineation
mylonitic foliation
mylonitic lineation
Mesoscopic Folds
axial surface (D1, D2)
D1 fold axis (symmetry = Z, S, M, unknown)
D2 fold axis (symmetry = Z, S, M, unknown)
Fractures / Faults
Mesoscopic fault / slip line
Joint / Fracture
M showings
Upper G showings
Lower G showings
E Zone Fault
contacts at E zone from Morris (1965)
Camp Fault
F showings
T showings
0
250 metres
metres
SCALE 1: 2,500
N
GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT
26,487
Map Sheet 1:
GEOLOGY
Ruddock Creek Property
British Columbia
1
File: RuddockGeology.dwg
SCALE: 1:2,500
Date: Dec. 7, 2000
Geology by P.D. Lewis
LEWIS GEOSCIENCE SERVICES INC.



mg Mafic (pyroxene, amphibole) gneiss

cs Calc-silicate gneiss, marble

ma Marble

ag Amphibole gneiss

qb Quartzo-feldspathic biotite schist

qz Quartzite, quartzose schist

bs Biotite schist

tr Massive tremolite/actinolite

pg Pegmatite/granite

Massive sulphide (exposed, projected)

lithologic contact

megascopic fault

megascopic fold axial trace

shear zone

0 250 metres

metres

SCALE 1:2,500

Map Sheet 2

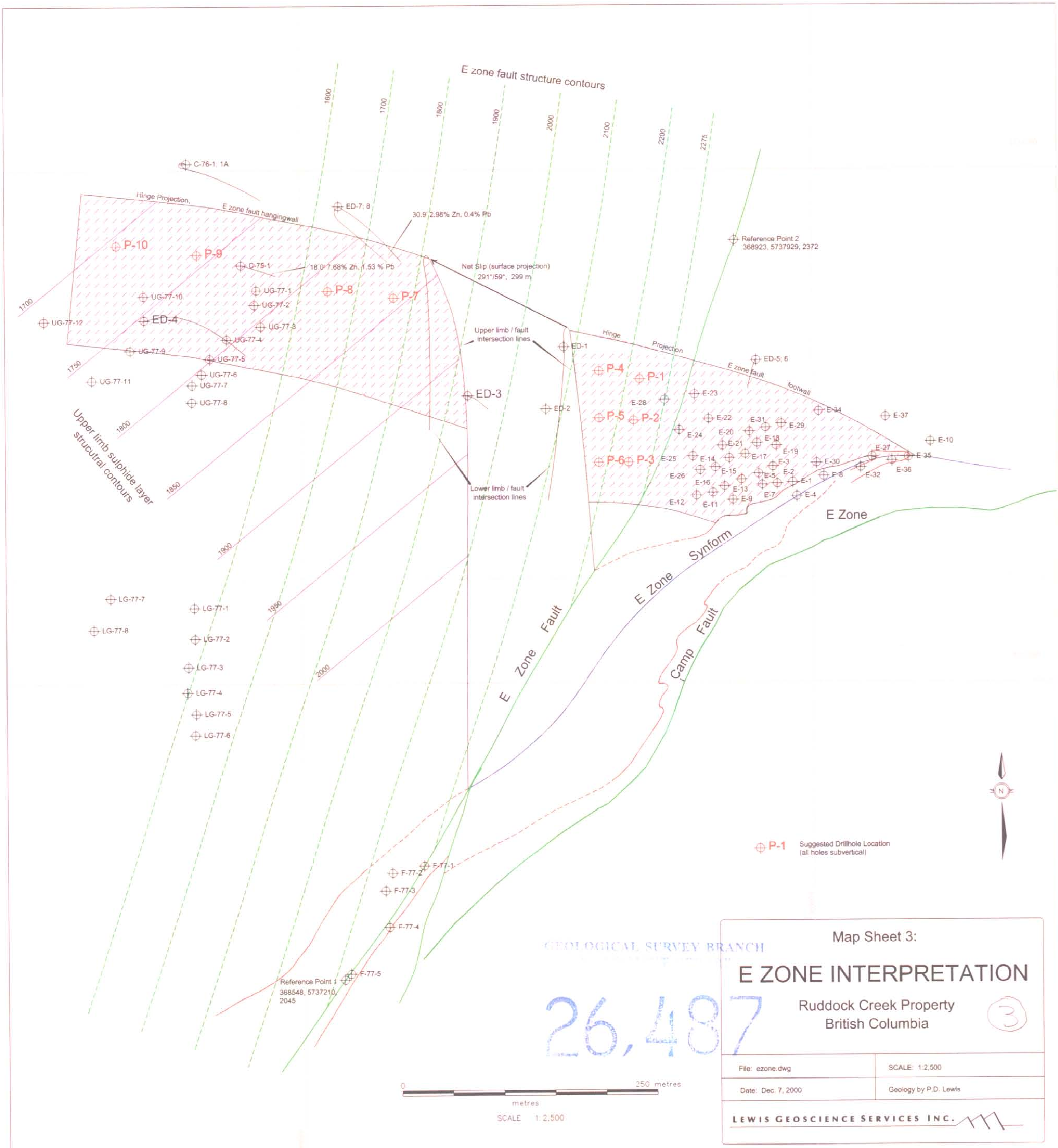
GEOLOGICAL SECTIONS

Ruddock Creek Property
British Columbia

2

File: RuddockSections.dwg	SCALE: 1:2,500
Date: Dec. 7, 2000	Geology by P.D. Lewis

LEWIS GEOSCIENCE SERVICES INC.



E zone fault structure contours
1600
1700
1800
1900
2000
2100
2200
2275
C-76-1; 1A
Hinge Projection,
E zone fault hangingwall
ED-7; 8
30.9' 2.98% Zn, 0.4% Pb
P-10
P-9
C-75-1
18.0' 7.68% Zn, 1.53 % Pb
Net Slip (surface projection)
291°/59°, 299 m
Reference Point 2
368923, 5737929, 2372
UG-77-1
UG-77-2
UG-77-3
UG-77-4
UG-77-5
UG-77-6
UG-77-7
UG-77-8
UG-77-9
UG-77-10
UG-77-11
UG-77-12
P-8
P-7
ED-4
Upper limb / fault
intersection lines
ED-1
Hinge
Projection
E zone fault
footwall
ED-5; 6
P-4
P-1
P-5
P-2
P-6
P-3
ED-3
ED-2
1700
1750
1800
1850
1900
1950
2000
Upper limb sulphide layer
structural contours
Lower limb / fault
intersection lines
E-1
E-2
E-3
E-4
E-5
E-7
E-8
E-9
E-10
E-11
E-12
E-13
E-14
E-15
E-16
E-17
E-18
E-19
E-20
E-21
E-22
E-23
E-24
E-25
E-26
E-27
E-28
E-29
E-30
E-31
E-32
E-34
E-35
E-36
E-37
E Zone
E Zone Synform
E Zone Fault
Camp Fault
LG-77-1
LG-77-2
LG-77-3
LG-77-4
LG-77-5
LG-77-6
LG-77-7
LG-77-8
F-77-1
F-77-2
F-77-3
F-77-4
F-77-5
Reference Point 1
368548, 5737210,
2045
N
P-1 Suggested Drillhole Location
(all holes subvertical)
0
250 metres
metres
SCALE 1: 2,500
GEOLOGICAL SURVEY BRANCH
26,487
Map Sheet 3:
E ZONE INTERPRETATION
Ruddock Creek Property
British Columbia
3
File: ezone.dwg
SCALE: 1:2,500
Date: Dec. 7, 2000
Geology by P.D. Lewis
LEWIS GEOSCIENCE SERVICES INC.

APPENDIX B:

I, Paul D. Gray, of 4460 West 12th Ave., Vancouver, in the Province of British Columbia, DO HEREBY CERTIFY THAT:

1. I am a geologist in the employment of Doublestar Rersources Ltd. with offices at 305-1549 Marine Drive, West Vancouver B.C.

2. I am a graduate of Dalhousie University, Halifax Nova Scotia, with a Bachelor of Science Degree in Geology.

3. I have been a practicing geologist in the mineral exploration industry continually since 1996.

4. That this report is based on data generated from fieldwork I oversaw performed from August 17, 2000 through September 4, 2000.

DATED at West Vancouver, British Columbia, this 19th day of February, 2000.

Paul D. Gray, B.Sc.

APPENDIX C:

CHIP SAMPLE DESCRITIONS

AND

ASSAY CERTIFICATES

All GPS positions are reported in NAD 27 Datum.

Grab/Chip Character Sampling Notes:

E-Zone-1:

BONDAR CLEGG TAG I.D. # **400122**

F-Zone-1:

Fine grained massive sulphide mineralization collected on eastern limb of F-Zone fault/fold. Sphalerite noted, hematite, galena?, biotite. Large pod of metiliferous zone sampled over ~ 2 meters. Collected *in situ* adjacent to 76-6 survey marker. Similar mineralization to E-zone, finer grained however.

BONDAR CLEGG TAG I.D. # **400135**

GPS:

11 3 686 14 Easting
57 37 298 Northing 2161 meters

F-Zone-2:

Collected over approx. 40 meters of strike length. Chiefly from the lower anatomizing section of the F-Zone Limb. Massive sulphide mineralization prevalent at top and bottom of limb.

BONDAR CLEGG TAG I.D. # **400131**

GPS:

11 3 686 14 Easting
57 37 298 Northing 2198 meters

G-Zone-1:

Lower G-Zone showing. Massive very fine grained massive sulphide (hematite, spahlerite?, galena?, pyroxene). Mylonites flank (east) mineralized zones. Mineralized zones trend parallel to up contour ridge and run length of it (~70m). Sample collected over ~ 2 meters.

BONDAR CLEGG TAG I.D. # **400136**

GPS:

11 3 684 07 Easting
57 374 70 Northing 2198 meters

G-Zone-2:

Upper G-Zone showing. Sampled proximal to DDH ED-4 (2 meters south). Slightly coarser grained than F-Zone. Mineralization consists of Calcite-Sphal-Hem-Galena? Exposure is ~ 4 meters thick by 10 meters wide.

BONDAR CLEGG TAG I.D. # **400138**

GPS:

11 3 683 42 Easting
57 378 55 Northing 2360 meters

M-Zone:

Massive Sulphide collected from 4 separate mineralized horizons within M-Zone (30 meters). Medium to coarse grained sulphide mineralization, 50% quartz, 10% pyrite, 30% sphalerite, 5% galena

BONDAR CLEGG TAG I.D. # **400133**

GPS:

11 3 682 90 Easting
57 385 29 Northing 2537 meters

T-Zone-1:

Sample of high grade sulphide mineralization. Fine grained, hematite, sphalerite?, galena? (Too fine grained to tell). Sample collected over ~ 4 meters, chiefly from one major pod (5 meters by 1 meter) hosted within schist and adjacent to fracture zone felsite (quartzite). Hinge zone related mineralization concentration

BONDAR CLEGG TAG I.D. # **400130**

GPS:

11 3 670 53 Easting
57 369 58 Northing 2160 meters

T-Zone-2:

Ultra fine grained massive sulphide mineralization within a tightly folded quartzite unit hosted in a pegmatite and schist exposure. Hinge zone related mineralization concentration. Sample collected along 7 meter strike length of hinge zone.

BONDAR CLEGG TAG I.D. # **400124**

GPS:

11 3 670 87 Easting
57 369 91 Northing 2168 meters

T-Zone-3:

Sample of middle T- Zone. Medium grained massive sulphide mineralization hosted with a series of tight folds (hinge zone). Quartzite unit hosts mineralization, both disseminated and massive. Sample collected along 6 meters of hinge zone strike length.

BONDAR CLEGG TAG I.D. # **400133**

GPS:

11 3 672 53 Easting
57 368 46 Northing 2098 meters

Lower T-Zone-1:

High graded, high grade mineralization of massive sulphides from extents of Lower T Zone. Collected over ~ 50 meters and from three distinct horizons of mineralized quartzite with Pegmatite. Major massive mineralization sampled from within hinge zones. Very fined grained on whole, with one small ~20 cm section, of coarse grained massive sulphide. Most mineralized horizons very thin (15-50 cm)

BONDAR CLEGG TAG I.D. # **400125**

GPS:

11 3 675 25 Easting
57 371 18 Northing 1969 meters

Top T-Zone-1:

High grade massive sulphide mineralization to semi-massive mineralization. Sampled at saddle at top of peak, collected over ~ 1.5 meters. Possible T-zone extension. Chip sampled across width.

BONDAR CLEGG TAG I.D. # **400121**

GPS:

11 3 676 76 Easting
57 370 89 Northing 2286 meters

U-Zone-1:

High grade massive sulphide sample collected over 5 meters. Sample of thin (10 cm) "skin" of massive sulphide, medium to coarse gained, pyrite, sphalerite, hematite, and biotite.

BONDAR CLEGG TAG I.D. # **400134**

GPS:

11 3 66 291 Easting
57 381 21 Northing 1985 meters

U-Zone-2:

High grade massive sulphide horizon sampled over 5 meters. Sample of 25 cm thick horizon on two limbs away from hinge zone (less than 1 meter separated the two). Quartzite host rock.

BONDAR CLEGG TAG I.D. # **400126**

GPS:

11 3 66 294 Easting
57 381 03 Northing 1985 meters

U-Zone-3:

Quartzite hosted massive sulphide horizon. Colleceted over 3 meters from one limb of two mineralized limbs separated by 1 meter. Limb was ~45 cm wide. High grade mineralization, hematite, sphalerite, galnena?, biotite.

BONDAR CLEGG TAG I.D. # **400132**

GPS:

11 3 66 294 Easting
57 381 03 Northing 1985 meters

U-Zone-4:

Massive Sulphide high grade mineralization. Extremely coarse grained (similar to E-zone). Single, 20 cm thick layer of massive mineralization. Located 15 meters down slope of GPS below:

BONDAR CLEGG TAG I.D. # **400127**

GPS:

11 3 66 294 Easting
57 381 03 Northing 1985 meters

C-Zone-1:

Eastern Showing sample. Collected immediately below major tremolite dyke. Specular Hematite noted, chalcopyrite?, Spahlerite?, Biotite, Sample collected over ~ 5 meters.

BONDAR CLEGG TAG I.D. # **400129**

GPS:

11 3 694 60 Easting
57 378 48 Northing 2360 meters

B-Zone-1:

Eastern Showing sample. Collected adjacent to and below major tremolite dyke. Specular Hematite noted, chalcopyrite, Spahlerite?, Biotite, Sample collected over ~ 10 meters.

BONDAR CLEGG TAG I.D. # **400128**

GPS:

11 3 695 45 Easting
57 378 68 Northing 2348 meters

A-Zone-1:

Eastern Showing sample. Collected proximal to tremolite dyke. Specular Hematite noted, chalcopyrite, Spahlerite?, Biotite, Sample collected over ~ 10 meters.

BONDAR CLEGG TAG I.D. # **400123**

GPS:

11 3 694 46 Easting
57 377 70 Northing 2314 meters

BONDAR CLEGG

Geochemical Lab Report

REPORT: V00-01772.0 (COMPLETE)

REFERENCE:

CLIENT: DOUBLESTAR RESOURCES LTD.

PROJECT: RUDDOCK CREEK

SUBMITTED BY: P. GRAY

DATE RECEIVED: 19-SEP-00 DATE PRINTED: 25-SEP-00

DATE APPROVED	ELEMENT		NUMBER OF ANALYSES	LOWER DETECTION	EXTRACTION	METHOD
000923	1 Au30	Gold	18	5 PPB	Fire Assay of 30g	30g Fire Assay - AA
000923	2 Ag	Ag - IC01	18	0.2 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	3 Cu	Cu - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	4 Pb	Pb - IC01	18	2 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	5 Zn	Zn - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	6 Mo	Mo - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	7 Ni	Ni - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	8 Co	Co - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	9 Cd	Cd - IC01	18	0.2 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	10 Bi	Bi - IC01	18	5 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	11 As	As - IC01	18	5 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	12 Sb	Sb - IC01	18	5 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	13 Fe	Fe - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	14 Mn	Mn - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	15 TE	Te - IC01	18	10 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	16 Ba	Ba - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	17 Cr	Cr - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	18 V	V - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	19 Sn	Sn - IC01	18	20 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	20 W	W - IC01	18	20 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	21 La	La - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	22 Al	Al - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	23 Mg	Mg - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	24 Ca	Ca - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	25 Na	Na - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	26 K	K - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	27 Sr	Sr - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	28 Y	Y - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	29 Ga	Ga - IC01	18	2 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	30 Li	Li - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	31 Nb	Nb - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	32 Sc	Sc - IC01	18	5 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	33 Ta	Ta - IC01	18	10 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	34 Ti	Ti - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	35 Zr	Zr - IC01	18	1 PPM	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA
000923	36 S	S - IC01	18	0.01 PCT	HCL:HNO3 (3:1)	INDUC. COUP. PLASMA

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK	18	2 -150	18	CRUSH/SPLIT & PULV.	18
				OVERWEIGHT/KG	6
				TRANS FROM POLY BAG	18

REMARKS: High blank and std for Zn and Pb are due to carryover. LON

REPORT COPIES TO: 305 - 1549 MARINE DRIVE INVOICE TO: 305 - 1549 MARINE DRIVE

BONDAR CLEGG

Geochemical Lab Report

CLIENT: DOUBLESTAR RESOURCES LTD.

REPORT: V00-01772.0 (COMPLETE)

PROJECT: RUDDOCK CREEK

DATE RECEIVED: 19-SEP-00 DATE PRINTED: 25-SEP-00

SAMPLE NUMBER	ELEMENT UNITS	Au30 PPB	Ag PPM	Cu PPM	Pb PPM	Zn PPM	Mo PPM	Ni PPM	Co PPM	Cd PPM	Bi PPM	As PPM	Sb PPM	Fe PCT	Mn PPM	TE PPM	Ba PPM	Cr PPM
V400121	TOP-T-ZONE 1	30	0.8	429	61	86	30	89	21	1.3	<5	<5	<5	>10.00	124	<10	12	47
V400122	E-ZONE	8	5.9	106	>10000	>10000	6	34	19	367.8	<5	<5	103	9.77	246	83	249	50
V400123	A-ZONE-1	6	<0.2	388	78	441	12	99	14	1.7	<5	<5	<5	>10.00	2699	<10	26	74
V400124	T-ZONE-2	<5	12.6	192	>10000	>10000	4	81	29	277.6	106	<5	63	>10.00	589	79	302	38
V400125	LOWER TZONE1	<5	3.7	244	>10000	>10000	9	160	22	201.1	<5	6	64	>10.00	308	73	440	62
V400126	U-ZONE-2	<5	3.7	90	>10000	>10000	5	17	19	213.4	<5	5	70	6.58	428	87	35	148
V400127	U-ZONE-4	<5	<0.2	17	265	>10000	<1	11	30	539.6	<5	<5	104	8.84	570	119	3	58
V400128	B-ZONE-1	<5	<0.2	132	92	748	8	23	5	1.8	<5	<5	<5	4.66	2923	<10	29	148
V400129	C-ZONE-1	<5	<0.2	102	57	498	10	38	11	1.9	<5	<5	<5	3.35	1001	<10	32	113
V400130	T-ZONE-1	<5	7.9	657	>10000	>10000	5	107	39	226.3	10	5	53	>10.00	504	78	231	41
V400131	F-ZONE-2	<5	2.7	88	>10000	>10000	10	20	11	109.3	<5	<5	51	3.79	231	47	111	151
V400132	U-ZONE-3	6	8.5	162	>10000	>10000	13	78	36	267.8	42	<5	70	>10.00	369	87	184	49
V400133	M-ZONE	<5	2.5	249	>10000	>10000	30	80	18	131.2	<5	<5	43	8.11	788	66	231	91
V400134	U-ZONE-1	8	1.8	248	8555	>10000	9	61	22	88.0	6	<5	22	6.56	110	48	269	87
V400135	F-ZONE-1	<5	9.6	308	>10000	>10000	12	123	26	225.4	52	<5	53	>10.00	337	76	259	52
V400136	G-ZONE-1	7	5.4	160	>10000	>10000	5	18	25	290.5	<5	<5	79	7.03	160	75	134	55
V400137	T-ZONE-3	<5	6.2	101	>10000	>10000	3	23	17	327.1	<5	<5	98	9.76	269	97	175	75
V400138	G-ZONE-2	<5	3.0	196	>10000	>10000	11	45	21	164.4	<5	<5	56	5.59	301	68	39	208

SAMPLE NUMBER	V PPM	Sn PPM	W PPM	La PPM	Al PCT	Mg PCT	Ca PCT	Na PCT	K PCT	Sr PPM	Y PPM	Ga PPM	Li PPM	Nb PPM	Sc PPM	Ta PPM	Ti PCT	Zr PPM	S PCT
V400121	10	<20	<20	11	0.17	0.02	0.47	0.03	0.04	21	13	<2	2	<1	<5	<10	0.03	1	6.29
V400122	20	<20	921	2	0.53	0.01	2.89	0.18	0.22	37	3	6	<1	<1	<5	<10	0.02	6	>10.00
V400123	59	<20	<20	18	0.60	0.09	0.67	0.01	0.07	29	11	<2	2	3	<5	<10	0.06	<1	5.02
V400124	19	<20	574	3	1.45	0.05	1.45	0.20	0.38	24	11	<2	5	3	<5	<10	0.05	<1	>10.00
V400125	42	<20	502	5	2.77	0.10	3.31	0.06	0.38	61	8	4	3	6	<5	<10	0.12	<1	>10.00
V400126	33	<20	571	1	0.22	0.02	0.78	0.02	0.14	10	2	<2	<1	2	<5	<10	0.03	<1	>10.00
V400127	1	<20	1137	<1	<.01	<.01	0.02	<.01	<.01	<1	<1	<2	<1	<1	<5	<10	<.01	<1	>10.00
V400128	75	<20	<20	15	0.94	0.18	1.09	0.02	0.03	42	19	4	3	6	<5	<10	0.07	<1	1.63
V400129	45	<20	<20	18	1.48	0.20	1.22	0.21	0.16	42	10	4	9	5	<5	<10	0.10	<1	1.46
V400130	28	<20	486	3	1.60	0.06	3.74	0.11	0.48	40	8	<2	2	4	<5	<10	0.09	1	>10.00
V400131	64	<20	266	7	1.42	0.08	3.24	0.16	0.62	39	7	4	5	12	<5	<10	0.12	<1	6.94
V400132	46	<20	712	2	1.07	0.05	1.87	0.15	0.33	14	4	2	5	3	<5	<10	0.06	<1	>10.00
V400133	63	<20	347	4	1.49	0.10	6.11	0.32	0.71	130	6	3	4	6	<5	<10	0.07	5	>10.00
V400134	41	<20	190	11	1.70	0.07	1.50	0.19	0.13	197	5	3	8	5	<5	<10	0.09	<1	7.03
V400135	46	<20	532	4	1.90	0.06	3.95	0.09	0.27	64	9	6	1	7	<5	12	0.17	3	>10.00
V400136	14	<20	703	2	0.57	0.02	4.96	0.34	0.25	64	3	3	1	<1	<5	<10	0.01	11	>10.00
V400137	26	<20	825	1	0.66	0.02	2.35	0.06	0.25	22	4	3	<1	<1	<5	<10	0.05	<1	>10.00
V400138	18	<20	471	2	0.24	<.01	1.81	0.03	0.06	17	4	<2	<1	<1	<5	<10	0.02	<1	>10.00

CLIENT: DOUBLESTAR RESOURCES LTD.
REPORT: V00-01772.0 (COMPLETE)

PROJECT: RUDDOCK CREEK
DATE RECEIVED: 19-SEP-00 DATE PRINTED: 25-SEP-00

STANDARD NAME / ELEMENT	Au30	Ag	Cu	Pb	Zn	Mo	Ni	Co	Cd	Bi	As	Sb	Fe	Mn	TE	Ba	Cr	V	Sn	W	La	Al	Mg	Ca	Na	K	Sr	Y	Ga	Li	Nb	Sc	Ta	Ti	Zr	S
UNITS	PPB	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PCT	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PCT	PCT	PCT	PCT	PCT	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PCT	PPM	PCT
ANALYTICAL BLANK	<5	<0.2	<1	5	82	<1	<1	<1	0.2	<5	<5	<5	<0.01	<1	<10	<1	<1	<1	<20	<20	1	<.01	<.01	<.01	<.01	<.01	<1	<1	<2	<1	<1	<5	<10	<.01	<1	<0.01
Number of Analyses	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mean Value	3	0.1	<1	5	82	<1	<1	<1	0.2	3	3	3	<0.01	<1	5	<1	<1	<1	10	10	1	<.01	<.01	<.01	<.01	<.01	<1	<1	1	<1	<1	3	5	<.01	<1	<0.01
Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Accepted Value	5	0.2	1	2	1	1	1	1	0.1	2	5	5	0.05	1	<1	<1	1	1	<1	<1	<1	<.01	<.01	<.01	<.01	<.01	<1	<1	<1	<1	<1	<1	<1	<.01	<1	<0.01
OX9 Oxide	469	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Number of Analyses	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean Value	469	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Accepted Value	465	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CANMET LKSD-2	-	0.4	35	55	313	3	25	16	1.1	<5	10	<5	3.83	1696	<10	214	29	48	<20	<20	58	1.61	0.60	0.59	0.04	0.28	33	29	3	17	5	7	<10	0.08	3	0.18
Number of Analyses	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mean Value	-	0.4	35	55	313	3	25	16	1.1	3	10	3	3.83	1696	5	214	29	48	10	10	58	1.61	0.60	0.59	0.04	0.28	33	29	3	17	5	7	5	0.08	3	0.18
Standard Deviation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Accepted Value	-	0.8	36	40	200	2	23	17	0.8	-	9	1	3.50	1840	-	-	29	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BONDAR CLEGG

Geochemical Lab Report

CLIENT: DOUBLESTAR RESOURCES LTD.

PROJECT: RUDDOCK CREEK

REPORT: V00-01772.0 (COMPLETE)

DATE RECEIVED: 19-SEP-00 DATE PRINTED: 25 SEP 00

SAMPLE NUMBER	ELEMENT UNITS	Au30 PPB	Ag PPM	Cu PPM	Pb PPM	Zn PPM	Mo PPM	Ni PPM	Co PPM	Cd PPM	Bi PPM	As PPM	Sb PPM	Fe PCT	Mn PPM	TE PPM	Ba PPM	Cr PPM	V PPM	Sn PPM
V400123 A-ZONE-1		6	<0.2	388	78	441	12	99	14	1.7	<5	<5	<5	>10.00	2699	<10	26	74	59	<20
Duplicate		<5	0.3	409	69	390	10	102	15	1.4	<5	<5	<5	>10.00	2717	<10	28	77	58	<20

SAMPLE NUMBER	W PPM	La PPM	Al PCT	Mg PCT	Ca PCT	Na PCT	K PCT	Sr PPM	Y PPM	Ga PPM	Li PPM	Nb PPM	Sc PPM	Ta PPM	Ti PCT	Zr PPM	S PCT
V400123 A-ZONE-1	<20	18	0.60	0.09	0.67	0.01	0.07	29	11	<2	2	3	<5	<10	0.06	<1	5.02
Duplicate	<20	17	0.60	0.09	0.69	0.01	0.07	30	10	<2	2	2	<5	<10	0.05	<1	5.30

BONDAR CLEGG

CLIENT: DOUBLESTAR RESOURCES LTD.
REPORT: V00-01772.1 (COMPLETE)

PROJECT: RUDDOCK CREEK
DATE RECEIVED: 01-FEB-01
DATE PRINTED: 5-FEB-01

SAMPLE NUMBER	ELEMENT UNITS	Pb PCT	Zn PCT	Zn PCT
R2 V400122	E-ZONE	6.20	>25.00	31.42
R2 V400124	T-ZONE-2	2.53	16.35	
R2 V400125	LOWER TZONE1	3.35	15.47	
R2 V400126	U-ZONE-2	2.39	17.86	
R2 V400127	U-ZONE-4		>25.00	36.85
R2 V400130	T-ZONE-1	4.33	14.09	
R2 V400131	F-ZONE-2	2.78	9.37	
R2 V400132	U-ZONE-3	3.43	21.65	
R2 V400133	M-ZONE	2.26	13.12	
R2 V400134	U-ZONE-1		7.12	
R2 V400135	F-ZONE-1	3.99	18.00	
R2 V400136	G-ZONE-1	5.42	>25.00	26.67
R2 V400137	T-ZONE-3	6.00	>25.00	27.84
R2 V400138	G-ZONE-2	2.22	14.10	

APPENDIX D:

Ruddock Creek Expenses Statement
2000 Field Season

August 18th – September 4th 2000

Paul D. Gray, Geologist	17 days @ $300.00/day	$5,100.00
Nils von Fersen, Gelogist	5 days @ $300.00/day	$1500.00
Coquihalla Toll	2 trips @ $20.00 return	$40.00
Van Rental	1 Van @ $359.99/week @ 17 days	$1307.67
Truck Rental	1 Truck @ $50.00/day @ 5 days	$250.00
Hotel	2 rooms @ $105.00/night/person	$525.00
Glentel Inc.	Satellite Phone Rental/Service	$711.91
Misc. Equipment acquisition		$872.23
Peter Lewis Geoscience	Geological Contractor	$21,434.83
Canadian Helicopters	4.5 h @ $650.00/hour + fuel	$3,391.58
Bondar Clegg	18 Rock samples Prep and Assay	$337.26

Total = **$ 35,470.48**

February 19, 2001

Paul D. Gray, B.Sc.

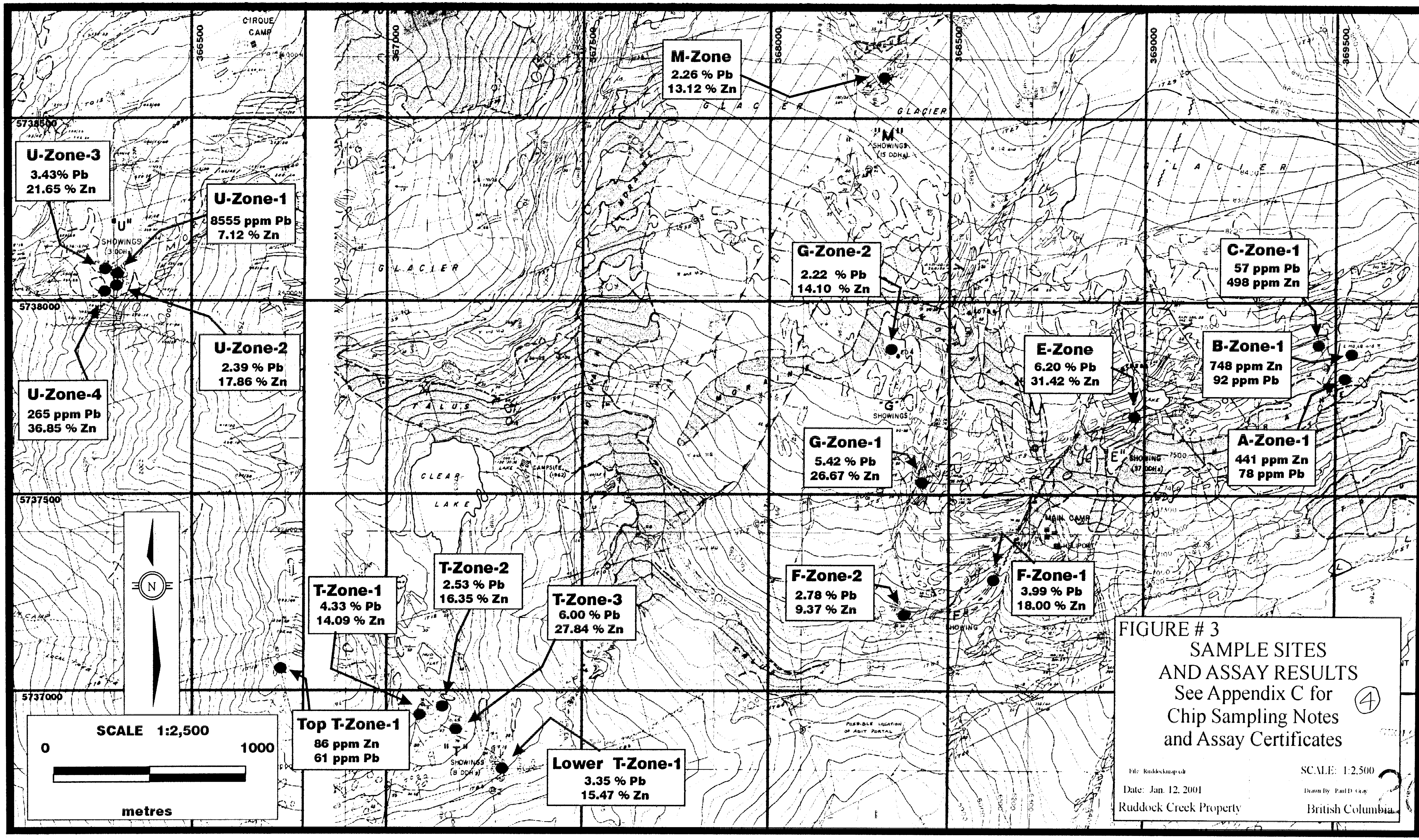


FIGURE # 3
SAMPLE SITES
AND ASSAY RESULTS
See Appendix C for
Chip Sampling Notes
and Assay Certificates

④

File: Ruddockmap.cdr
SCALE: 1:2,500
Date: Jan. 12, 2001
Drawn By: Paul D. Gray
Ruddock Creek Property
British Columbia

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

26,487