LOG NO: 0402 RD.
ACTION:

FILE NO:

Geological, Geochemical and Geophysical REPORT on the Ball Creek Project

Liard Mining Division

N.T.S. 104G/8W

Latitude 57° 16' North Longitude 130° 25' West

GEOLOGICAL BRANCH
ASSESSMENT REPORT

19,316

PART 1 OF 2

Owner of claims: Chevron Minerals Ltd.
Operator: Placer Dome Inc.

Authors: John Kowalchuk, Rein Turna
Date: March 30, 1990

SUMMARY

Exploration on the Ball Creek property in 1989 confirmed the presence of porphyry copper-gold mineralization on the property.

Soil geochemistry outlined a broad area of significantly anomalous copper and gold lying upon and around a molybdenum rich core. Silver, lead and zinc geochemistry provide a halo around the copper-gold zone similar to the metal pattern recognized around several classical porphyry copper-gold deposits such as Battle Mountain in Nevada.

Geological mapping, complemented by results from magnetic surveys and Induced Polarization surveys defined an alteration pattern which fits the general Lowell and Guilbert model for porphyry copper deposits. The geochemical metal zonation also fits the porphyry model of alteration and metallogeny.

All previous drilling was performed in the central potassic alteration zone of the deposit. Much of the drill core was anomalous in gold, with several drill holes intersecting zones averaging greater than 0.1 grams/tonne gold. A 137 metre section of drill hole 73-2 averaged 0.37 grams/tonne gold. The potassic alteration zone is not the optimum zonation for potential gold concentration in a porphyry system. Better gold values are commonly enhanced either on the inner flanks of the phyllic zone or in the propylitic zone. The high gold values for core in the potassic zone are a favourable sign that the other parts of the porphyry deposit could carry economic levels of gold mineralization.

A program of diamond drilling to check the copper and gold content of the rocks in the zone between the potassic and phyllic zones is proposed. This program should confirm that copper and gold occurs in economic grades and amounts on the property.

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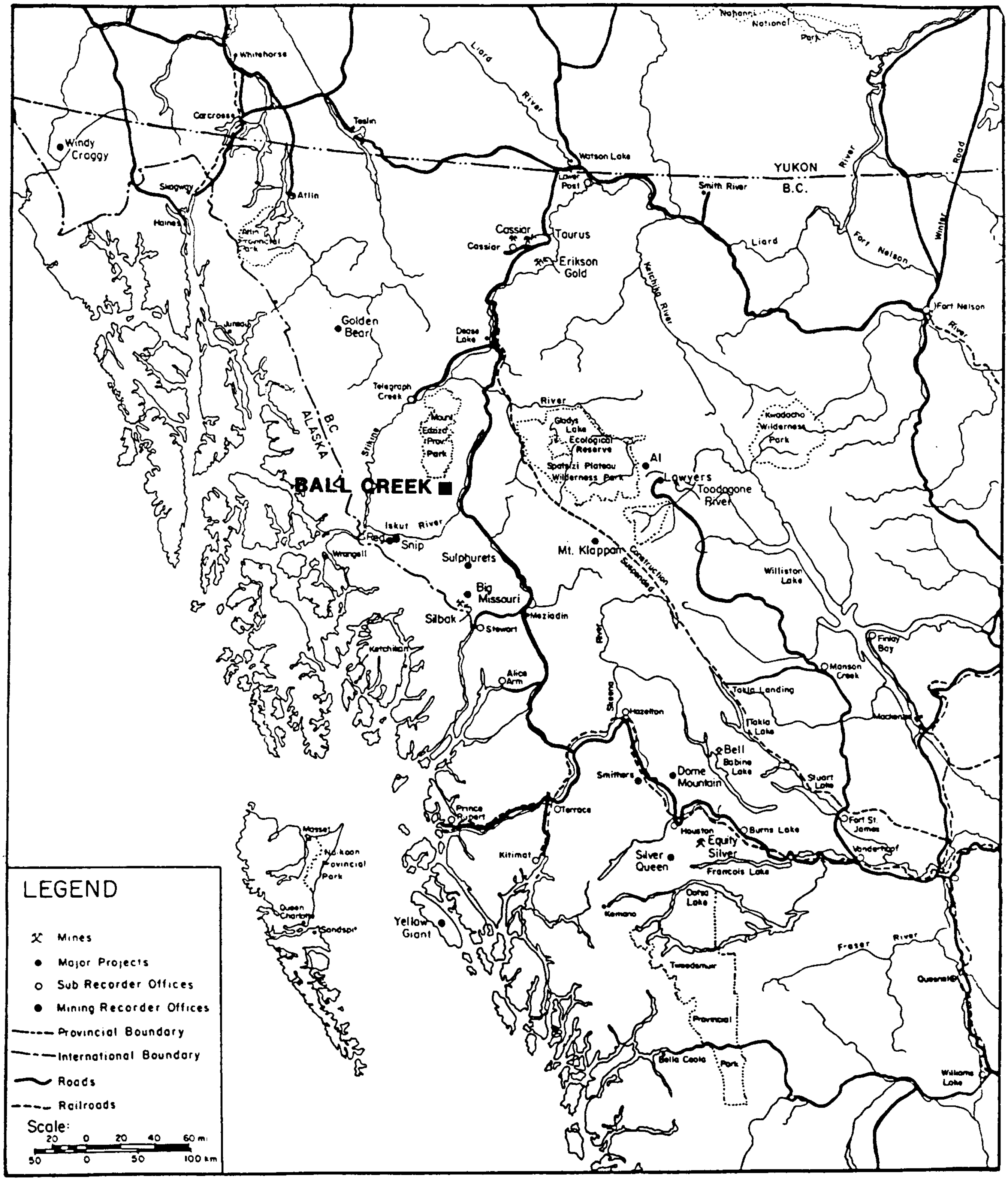

FIGURE 1

BALL CREEK

PROPERTY LOCATION MAP

1.0 INTRODUCTION

1.1 Location and Access

The Ball Creek property lies along the western edge of the Bowser Basin about 150 km north of Stewart B.C. and 140 km south of Dease Lake. The claims are plotted on NTS map sheet 104G/8W, at coordinates 57^{o} 16' north latitude and 130^{o} 25' west longitude (Figure 1).

Access to the property is by helicopter from Tatogga Lake, 55 km to the northeast. Helicopters based at Dease Lake and helicopters stationed in the Iskut and Sulphurets camps, 80 km to the southwest and south, can also be used for access. The exploration camp can be mobilized and demobilized by helicopter from the Barrage Creek airstrip on Highway No. 37, 10 km to the east.

Road access from the Stewart Cassiar Highway, 10 kilometres to the east would be easy to construct along the Ball Creek Valley. A bridge would be required to cross the Iskut River.

1.2 Topography and Vegetation

The property lies along the western edge of the Intermontane Belt. The topography is rugged with elevations ranging from 700 metres to 1990 metres. Some areas are extremely rugged, with cliffs of 200 to 500 metres common. The Camp Zone and most of the areas above treeline (about 1300 metre elevation) are quite gentle and are easily traversed by foot.

The lower parts of the property are covered with fir and spruce. Timber is generally small and of no economic importance.

1.3 Property Description

The property consists of mineral claims with the names BARE, BR,ME, MENT, MOM, ROG, TARA, DON. Refer to Table No. 1 for a complete list of the claims. The claim locations are plotted on Figure 2.

COMP: 410 - CHEVRON MINERALS LTD. PROJ: M420 - BALL CREEK J.V.

CLAIM NAME + NUMBER	FILE NO.	EFFECTIVE DATE	EXPIRY DATE	HECTARES GROSS	HECTARES NET	ACRES GROSS	ACRES NET
B.C. MINERAL CLAIM-ROG 22	030086	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 23	030087	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 24	030088	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 25	030089	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 26	030090	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 27	030091	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 29	030092	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 31	030093	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 33	030094	1970-08-25	1991-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 34	030095	1970-08-25	1991-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 1	030812	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 2	030813	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 3	030814	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 4	030815	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 5	030816	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 6	030817	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 7	030818	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 8	030819	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 9	030820	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 10	030821	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 11	030822	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 12	030823	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 13	030824	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 14	030825	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 15	030826	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 16	030827	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 17	030828	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 18	030829	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 19	030830	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 20	030831	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 21	030832	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 22	030833	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 23	030834	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 24	030835	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 25	030836	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 26	030837	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-TARA 27	030838	1971-09-28	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIMS-DON 1 TO 4	036286	1979-11-09	1991-11-08	1,025.00	1,025.00	2,532.74	2,532.74
PROJECT TOTAL				2,805.00	2,782.20	6,931.12	6,874.78

1989-05-05 LIST OF CLAIMS BY PROJECT NUMBER - PGM. LLCLS066

COMP: 410 - CHEVRON MINERALS LTD. PROJ: M420 - BALL CREEK J.V.

CLAIM NAME + NUMBER	FILE NO.	EFFECTIVE DATE	EXPIRY DATE	H E C T A R E S GROSS	NET	A C R E S GROSS	NET
B.C. MINERAL CLAIM-BARE 1	032323	- -	1990-07-17	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-BARE 2	032324	- -	1990-07-17	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-BR 1	032334	- -	1991-07-17	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-BR 2	032335	- -	1991-07-17	20.00	8.60	49.42	21.25
B.C. MINERAL CLAIM-BR 3	032336	- -	1991-07-17	20.00	8.60	49.42	21.25
B.C. MINERAL CLAIM-ME 1	030048	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 2	030049	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 3	030050	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 4	030051	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 5	030052	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 6	030053	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 7	030054	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 8	030055	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 9	030056	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 10	030057	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 11	030058	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 12	030059	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 13	030060	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 14	030061	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 15	030062	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 16	030063	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 17	030064	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ME 18	030065	1970-08-19	1990-08-18	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MENT 7FR	030897	1971-08-18	1990-08-17	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 4	032315	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 5	032316	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 6	032317	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 7	032318	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 8	032319	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 9	032320	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 10	032321	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-MOM 11	032322	1971-09-21	1991-09-27	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 1	030066	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 2	030067	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 3	030068	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 4	030069	1991-08-24	1991-08-25	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 5	030070	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 6	030071	1970-08-25	1991-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 7	030072	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 8	030073	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 9	030074	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 10	030075	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 11	030076	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 12	030077	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 13	030078	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 14	030079	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 15	030080	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 16	030081	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 17	030082	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 18	030083	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 19	030084	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42
B.C. MINERAL CLAIM-ROG 20	030085	1970-08-25	1990-08-24	20.00	20.00	49.42	49.42

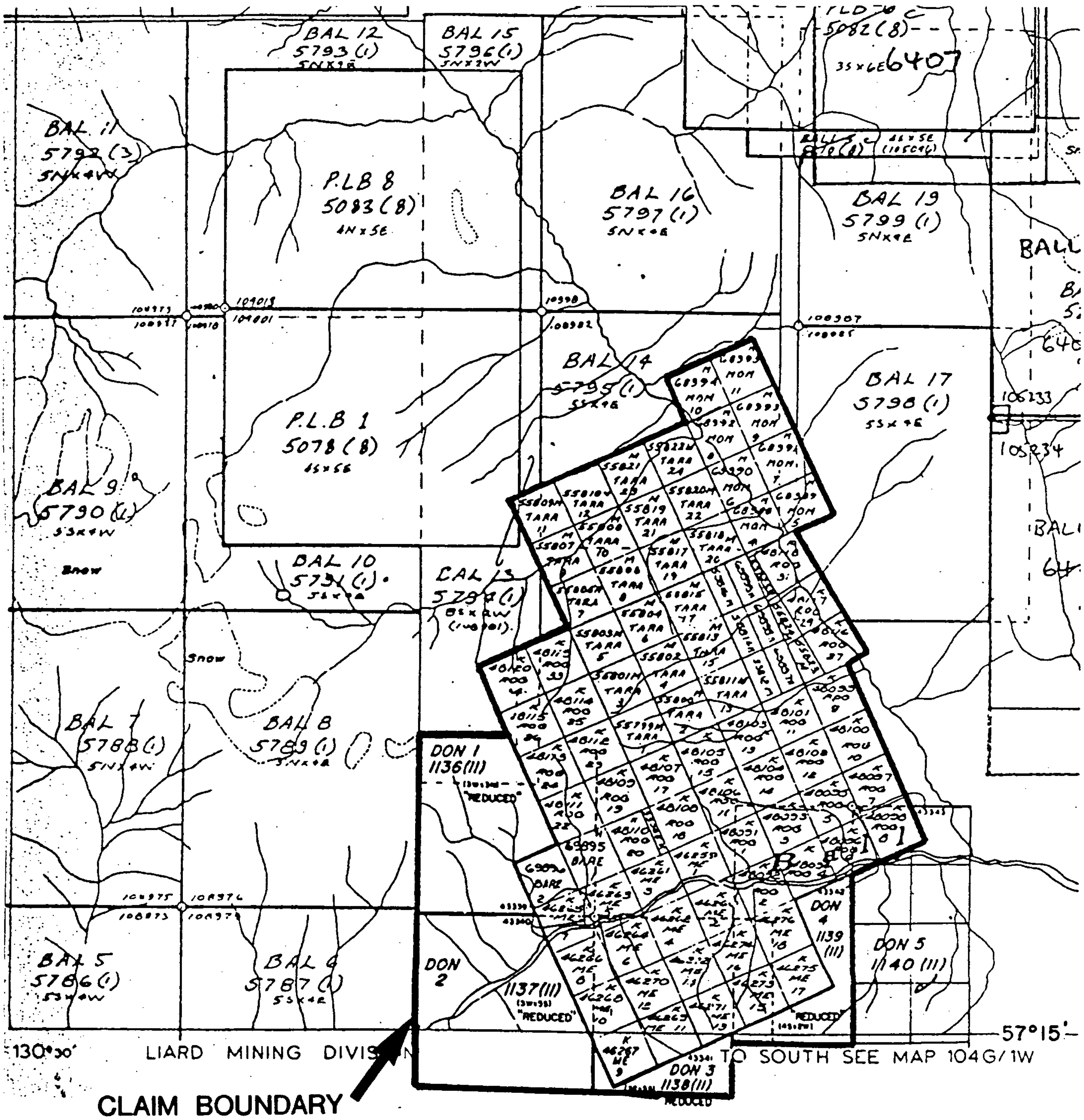

FIGURE 2

0 1 2 3 4 5

KILOMETRES

PLACER DOME INC.	
BALL CREEK PROJECT	
DRAWN BY : R.TURNA	**CLAIM MAP**
DATE: NOV. 1989	
SCALE 1: 50,000	
REVISED:	FILE Nº. 104G/8W

CHONG

1.4 History

1929: Five claims were staked for A.B. Trites.

1963: The Mary claim group was staked for Southwest Potash Corp.

Six shallow, bore holes were drilled totalling 60 metres (199 feet). Geological mapping and soil sampling were also performed. The work was concentrated on a molybdenite showing in the Cliff Zone.

1966: Stikine Exploration restaked the area but did no work.

1970: The Greg claim group was staked by Newmont Exploration of Canada Ltd. Geological mapping, geochemistry and ground magnetometer work were performed.

Great Plains Development Company of Canada Ltd. and Chevron Standard Limited staked the ME and ROG claims.

1971: Great Plains staked the TARA claims over the lapsed Greg claims of Newmont. The MENT and MOM claims were also staked.

Geological mapping, and geochemical sampling were performed in the Cliff and Goat Zones. Reference: Assessment Report 3186.

1972: Great Plains performed geological mapping, soil sampling and an induced polarization survey over an area centred on the Camp Zone. References: Assessment Reports 3978, 3979.

1973: The BR and BARE claims were staked. Great Plains performed further geological mapping and induced polarization surveys over the Cliff Zone and the Goat Zone and also drilled 571 metres (1874 feet) in three holes in the Camp Zone. Reference: Assessment Report 4651.

1974: Great Plains performed 649 metres (2132 feet) of diamond drilling in three holes in the Camp Zone. The core is now lost. Rock sampling was also performed in the Cliff, Goat and DM (Camp Creek and Border Creek) Zones. Reference: Assessment Report 5168.

1975: Great Plains performed 792 metres (2600 feet) of diamond drilling in five holes in the Camp Zone. Induced polarization was done over the Camp Zone. The geological history was reinterpreted and a model was formulated. Reference: Assessment Report 5709

1979: G.R.C. Exploration Company Ltd. negotiated an option on the Ball Creek property from the owners, Norcen Energy Resources Ltd. (formerly Great Plains) and Chevron Standard Ltd.

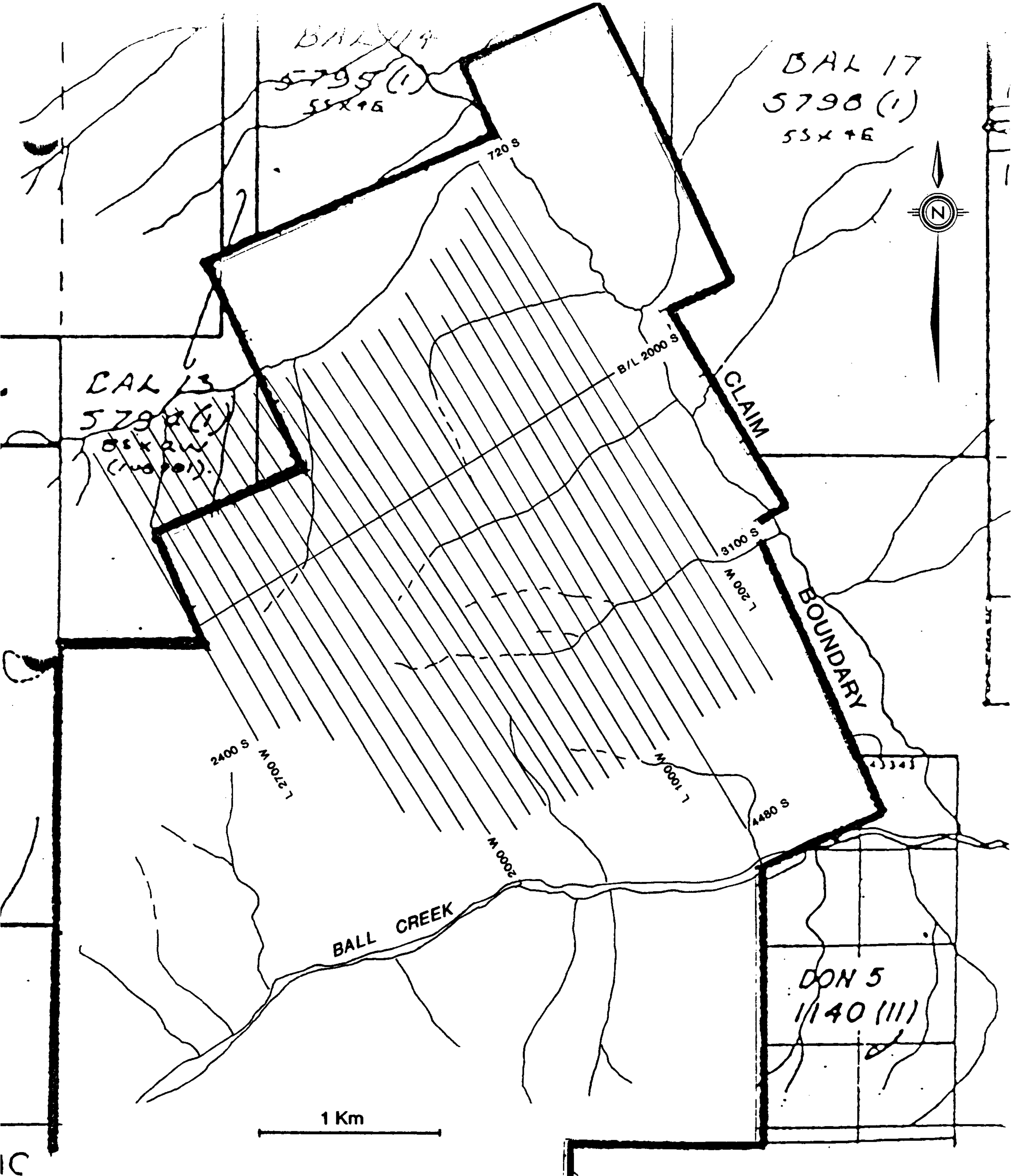

FIGURE 3
BALL CREEK
GRID LOCATION MAP

243 104G/8

1980: J.R. Woodcock Consultants Ltd. supervised the drilling of two diamond drill holes totalling 953 metres (3127 feet). This program was performed on the South Zone, south of Ball Creek. Geological mapping and geochemical sampling were also performed both on the South Zone and to the north of Ball Creek, on the Goat Zone and the upper Knob Creek area. The BALL claims were staked, seven kilometres southwest of the DON claims. The BALL claims were cursorily examined in 1980 and allowed to lapse. Reference: Assessment Report 8546.

1989: Chevron Minerals Ltd. optioned the property to Placer Dome Inc. The work program completed by Placer Dome Inc. consisted of geological mapping, geochemical sampling, induced polarization, magnetometer and VLF-EM surveys. Drill core from 1973 and 1975, found at the campsite, was relogged and segments of the core were assayed for gold. The core from the 1974 drilling was not found.

1.5 1989 FIELD PROGRAM

Geological mapping at a scale of 1:5,000 was performed over eleven square kilometres. A 52 kilometre grid was located on which soil sampling, magnetics and VLF EM surveys were performed. Field crews collected 1,410 soil samples which were analyzed for gold, copper, silver, molybdenum, lead, zinc and arsenic. Geologists also collected 386 rock samples which were analyzed for the same elements. Drill core from the 1973 and 1975 diamond drill programs was relogged and quartered. These splits, totalling 280 samples were fire assayed for gold and analyzed for arsenic. The core had previously been assayed for copper and molybdenum. Part of the survey grid (20.6 kilometres) was cut and induced polarization surveys were run over the lines.

The total cost of the 1989 field program was $316,380. See the Itemized Cost Statement at the end of the text.

2.0 GEOLOGY AND MINERALIZATION

2.1 REGIONAL GEOLOGY

The Ball Creek area lies within Stikinia, a tectonic terrane comprised of Mississippian to Jurassic marine and non marine volcanic and sedimentary rocks and subvolcanic intrusions.

The Stikine Arch lies to the north of the property. This terrane, tectonically active during most of Mesozoic time consists primarily of Triassic and Jurassic eugeosynclinal igneous and metamorphic rocks. Immediately north of the property, the Stikine Arch is overlain by the Mount Edziza volcanic complex, an upper Tertiary to Recent assemblage of basic to acid volcanic rocks produced by a combined shield and stratovolcano.


BALL CREEK
Kakiddi Lake
Nuttlude Lake
Mowdade Lake
COCOA CRATER
COFFEE CRATER
ARMADILLO PEAK
Spectrum Range
HANKIN PEAK
Ball Creek
Dudidontu River
PLACER DOME INC
FIG.4
BALL CREEK PROJECT
REGIONAL GEOLOGY
JAN. 1990
0 10 20 Km
SCALE
104G/8

The Bowser Basin tectonic unit lies ten kilometres east of the property. This unit consists mainly of upper Jurassic to Early Cretaceous marine and non marine sediments. Rocks of the Bowser Group unconformably overlie the older volcanic rocks of the Stikine Arch. Seventy kilometres west of the property, Mesozoic and Tertiary intrusives of the Coast Plutonic Complex occur.

The Ball Creek property is underlain by upper Triassic andesites and sediments which are intruded by a Late Triassic granodiorite stock. The regional geology is shown as Figure No. 3.

2.2 PROPERTY GEOLOGY

2.2.1 GENERAL

Most of the property is underlain by upper Triassic andesitic pyroclastics, flows and sediments which are intruded by Late Triassic monzonites. The monzonites appear on the surface as dykes. The two largest dykes trend north-south across the Camp Zone. These two dykes appear to be related to a buried stock underlying the Camp Zone. Monzonite dykes outside of the Camp Zone trend roughly east-west and parallel to the Cliff-Knob Creek fault zone. The previously mentioned rocks are shown as Units 1 to 5 on Figure No. 5 (Property Geology) and are referred to as the Volcanic Sequence.

The Volcanic Sequence is unconformably overlain by an Epiclastic Sequence (Units 6 to 12). This suite of rocks was derived from the older andesites and from basalt flows located at the base of the sequence. This sequence is overlain by sediments containing a lower Jurassic pelecypod (Weyla).

Structurally, the property is divided into two domains. Between Barren Fault and Ball Creek, the geology is dominated by a major east-west fault zone, called the Cliff-Knob Creek fault zone. This fault zone is believed to continue to the southwest along Ball Creek. The area between Barren Fault and Border Creek is underlain by the south-dipping limb of an anticline whose axis trends along Border Creek. The larger faults in the Camp Zone trend either east-west or north-south. The major dykes in the Camp Zone trend north-south.

2.3 LITHOLOGY

VOLCANIC SEQUENCE: from oldest

1. Sedimentary rocks

These rocks occur along the northern boundary of the property, in the lower parts of Border Creek and Fossil Creek. The low topographic position of the unit plus the occurrence of this unit in the core of the Border Creek anticline suggests that they are the oldest rocks on the property. Pelecypods and gastropods collected by the Ministry of Mines in 1975 provide a Norian (upper Triassic) age to these rocks.

At the northern end of Line 400W, in Border Creek, black siliceous argillites predominate. These rocks are massive and very fine grained. The rocks carry no recognizable pyrite, however carbonate veinlets in some outcrops were slightly pyritic. The rocks are hard and resistant to weathering.

Along the lower sections of Fossil Creek, calcareous siltstones and sandstones form large outcrops. The sandstones weather light brown in colour and show good sorting and bedding. The beds, one to two centimetres thick, are contorted. The rocks are quite sheared and weather easily. Minor amounts of pyrite are found along fractures. Some of the sandstone outcrops have been stained to a rusty colour by groundwater draining the Camp Zone gossan. Pelecypods were found in one of the Fossil Creek outcrops.

2. Andesite

The andesitic rocks are divided into the following classifications: undifferentiated(2), pyroclastics(2a), flows(2b), and dykes(2c). Pyroclastics are the most common rock type in the unit, followed by flows which are difficult to identify due to the destruction of their original flow textures by alteration. Andesite dykes are not common.

Unaltered outcrops weather a grey colour. Pyrite rich outcrops are coated with a rusty stain.

Unit 2 andesites are the thickest unit on the property. In the Camp Zone the andesites are quite shattered and hydrothermally altered. The fracturing and alteration was caused by the influx of fluids accompanying the intrusion of the Upper and Lower Dykes.

(2a) Pyroclastics

Pyroclastic rocks can be separated into two specific types; lithic tuffs, observed in outcrops in Middle Creek and the lower part of Camp Creek, and lapilli tuffs, observed in the higher parts of the property, generally above the 1400 metre elevation.

The lithic tuffs are green in colour, poorly sorted and medium grained in size. Most of the clasts are angular or subrounded argillite fragments. The larger clasts are black and up to half a centimetre in size. Other clasts appear andesitic. The clasts are supported by a matrix consisting of finer grains of the same rock types as the clasts. Type examples of the lithic tuffs are found in Middle Creek at 1140 and 1280 metres elevation. A sample from the latter location (sample 89T20) is described in Appendix No. 2, Petrographic Report.

At Middle Creek, the lithic tuffs are not mineralized. Outcrops adjacent to faults or fractures are pyritic and rusty weathering. The weakly gossanous cliff between Lines 700W and 800W on the northwest side of the baseline carries anomalously amounts of pyrite, probably related to the pyrite halo about the Camp Zone.

The lapilli tuffs typically occur as relatively unaltered outcrops southeast of Big Red Hill. They are greenish grey in colour; coarse grained and poorly sorted in texture. Clasts, composed of porphyritic andesite are subrounded to rounded in shape. Clasts in the lapilli tuffs range from 2.0 to 5.0 centimetre size. The clasts are supported by an andesitic matrix.

The outcrops southeast of Big Red Hill are unaltered and unmineralized. Some outcrops between Big Red Hill and Little Red Hill carry up to 3% pyrite. These rocks show strong propylitic alteration, with epidotized clasts and extensive chlorite alteration of the matrix. Lapilli tuff, outcropping within the Cliff-Knob Creek fault zone is often brecciated and pyritized.

(2b) Flows

Very few flows have been mapped as outcrop. Either the flows are limited in extent, or they are hard to recognize due to the destruction of primary structures by intense hydrothermal alteration. The presence of flows is indicated by massive relict bedding in the intensely altered cliffs in Fossil Creek and in the north arm of Knob Creek. The great thickness of the bedded cliffs in these creeks suggest that the flows may be a significant part of the andesite package. The pyroclastics do not produce thick beds. Flow textures have also been recognized in thin sections of altered andesitic core from drill holes DDH73-1, DDH73-2, DDH73-3.

The flows occur between the lithic tuffs and the lapilli tuffs.

(2c) Dykes

Andesite dykes are observed in Camp Creek and in the upper parts of Border Creek and East Cliff Creek. The exact stratigraphic position for the dykes is not clear since they appear to intrude both Unit 3 and Unit 5 rocks. They are included with the Unit 2 andesites because of their composition. This whole volcanic package is thought to have been deposited over a very short period of time.

The dykes are chloritic and dark green in colour. Along Border Creek and East Cliff Creek, they are porphyritic with plagioclase phenocrysts up to 0.5 centimetres in size. One dyke along Camp Creek is about one metre thick and stands out in dark and prominent relief against the highly altered, pyritic surrounding rocks.

3. Monzonite

The monzonites of Unit 3 are only observed as dykes. The larger dykes have been named: Lower Dyke(3a), Upper Dyke(3b) and Ridge Dyke(3c). Smaller unnamed dykes were located along Fossil Creek and in the Cliff-Knob Creek fault zone.

In outcrop, the monzonites are easily recognized by their prominent potash feldspar phenocrysts, smaller plagioclase phenocrysts, and a crystalline texture. Upper and Lower Dykes, where they are removed from the zone of porphyry mineralization have significantly less pyrite than do the surrounding rocks. They are also harder and more resistant to weathering than the surrounding rocks. Upper Dyke forms a recognizable resistant ridge along the middle third of its exposure.

In 1975, the Ministry of Mines calculated a potassium argon age date of 218 +/- 24 million years which would place the monzonite as Late Triassic in age.

(3a) Lower Dyke

Petrographic descriptions of samples from the Lower Dyke can be found in the Petrographic Report (Appendix No. 2). Lower Dyke rocks are labelled 89T10, 89T23, 89T32 and 89T85.

The Lower Dyke is a porphyritic rock consisting of potash feldspar crystals in a fine grained matrix. Up to 75% of the rock is made up of phenocrysts ranging from 1.0 to 10 millimetres in size. The light grey matrix is essentially plagioclase with lesser potassic feldspar, minor quartz, mafics and pyrite. Lower Dyke is finer grained than the other monzonite dykes. It is also referred to as a latite porphyry.

(3b) Upper Dyke

Petrographic descriptions of Upper Dyke rocks can be found in Appendix No. 2. Samples described are 89T75, 89T79, 89T125 and 89T134.

The Upper Dyke monzonite is a medium grained porphyritic rock. Plagioclase and minor orthoclase phenocrysts ranging from 1.0 to 4.0 millimetres in size constitute 50% of the rock. Large 10.0 millimetre potash feldspar phenocrysts occasionally occur. Potash feldspar, along with smaller amphibole and biotite make up about 30% of the coarse fraction of the rock. The composition of the matrix is similar to that of the phenocrysts. Quartz and pyrite are minor constituents. Mafics and magnetite, although not abundant, are more common in Upper Dyke rocks than in the other monzonites. Upper Dyke rocks are usually grey in colour, however epidote and pyrite occasionally produce a darker colour in some specimens. Weathered surfaces are usually stained rusty by iron rich waters draining surrounding pyritic rocks.

The Upper and Lower Dykes have not been altered by the porphyry event as were the surrounding andesitic rocks. Although the intrusion of the monzonite is thought to be the cause of the hydrothermal event which produced the regional alteration and porphyry mineralization, the dykes themselves were not altered. They may have been emplaced late in the overall intrusive event.

(3c) Ridge Dyke

Thin section specimens of Ridge Dyke monzonites are described in Appendix No. 2. The sections described are labelled 89T194 and 89T197. The composition and texture of the Ridge Dyke are similar to those of the Upper Dyke. Pink potash feldspar phenocrysts up to 1.0 centimetre size occur within a medium grained matrix of plagioclase and potash feldspar, minor quartz, biotite and pyrite. The hand specimens and outcrops are light grey in colour.

Ridge Dyke appears to be the faulted and rotated extension of Upper Dyke. The Ridge Dyke, if rotated to the south, would align and connect with Upper Dyke at Big Red Hill. The two dykes have the same composition and texture. Although no fault has been mapped in this location, the VLF EM and magnetic survey signatures suggest a fault exists that has shifted and rotated the dyke to produce the two diverging dykes.

OTHER DYKES

Specimens of these dykes are described in Appendix No. 2. The samples are labelled 89T46, 89T65, 89T122 and 89T132.

Several small monzonite outcrops lie within the shattered zone between Barren and Cliff Faults. They all have a similar composition and texture, which is the same as the composition of Lower Dyke. They may be the disrupted fragments of a large dyke which is the rotated extension of Lower Dyke, similar in structural relationship to that of Upper and Ridge Dykes. The many smaller monzonite dykes show the same lack of hydrothermal alteration as the larger monzonite dykes.

Two dykes (sample 89T46) from East Cliff Creek which contains 11% quartz, and the dyke (sample 89T132) from south of Big Red Hill which contains 58% potash feldspar are not part of this family of small monzonite outcrops.

4. Trachyandesite

This porphyritic rock has a pronounced trachytic flow texture, large potash feldspar phenocrysts and a dark colour. It is observed in several different modes: plug(4a) at Trachyte Knob, flows(4b) atop East Cliff Creek and a small dyke(4c) in the Cliff Zone. Thin sections described in Appendix No. 2 were taken from Trachyte Knob (sample 89T164) and from the flows above East Cliff Creek (samples 89T184 and 89T186).

The rock is porphyritic with 60 % of the rock consisting of plagioclase phenocrysts. A further 10% of the rock is made up of large (up to 2.0 centimetres long) potash feldspar phenocrysts. The plagioclase crystals show a strong flow lineation and appear to flow around the larger potash feldspar crystals. Both the orthoclase and the plagioclase crystals are well formed.

Trachyandesites are very fresh looking and show none of the alteration observed in the surrounding rocks. They are quite magnetic and contain up to 5% magnetite. This resistant rock forms prominent hills such as Trachyte Knob.

5. Lahar

The lahar consists of porphyritic andesite clasts supported by an andesite matrix. The rock is poorly sorted both at the hand specimen level and at the outcrop level. Clasts range in size from 2.0 centimetres to greater than 10.0 centimetres. Some clasts are greater than 30.0 centimetres. The matrix usually comprises less than 50% of the rock. The colour of the clasts ranges from maroon to grey and green. The outcrops are green in colour. Outcrops occasionally carry carbonate veins containing pyrite.

The lahar is very friable and produces outcrops surrounded by thick talus. Sedimentary structures are difficult to recognize because of the friable nature of the rock. Boulders of coarsely bedded lahar were found near the headwaters of Fossil Creek.

UNCONFORMITY

CLASTIC SEQUENCE: from oldest

6. Basalt Flows

This porphyritic and amygdaloidal basalt unit, interbedded with pillow basalts is thin and limited in extent. The porphyritic basalts consist of 25% plagioclase phenocrysts in a black aphanitic matrix. The phenocrysts are 0.5 to 1.0 centimetres in size and often show a flow foliation. Locally the rock is quite vesicular with calcite filled amygdules. The rocks are finely crystalline in texture. Black aphanitic pillow basalts occur across lateral facies boundaries with the above porphyritic basalts. The pillow basalts are locally highly vesicular and are quite friable in texture.

The basalts are non pyritic and strongly magnetic. Jasper veinlets occur occasionally throughout these basalts.

7. Basaltic Mudstone

This mudstone unit is derived from erosion of Unit 6 basalts. The mudstones are fine grained and well sorted. The mudstone also shows fine silty lamination structures. The outcrops are dark brown and maroon in colour. They are strongly magnetic. The outcrops are very friable and recessive weathering. The basaltic mudstone is a thin unit, localized to the outcrop area of the parent basalts. Lighter coloured, andesites form thin beds within this unit.

8. Andesitic Greywacke - Conglomerate

This greywacke is contemporaneous with and interfingers with the basaltic mudstone. Subangular to rounded clasts occur in a fine grained and occasionally crumbly matrix. The clasts consist of fine grained andesite, porphyritic andesites and lapilli tuff. The clasts in the conglomerate vary from a few millimetres to several centimetres in size. The clasts in the greywacke are usually less than one millimetre in size. Weathered surfaces are medium to dark grey in colour.

9. Limestone

Only one small dark grey outcrop of impure limestone was found.

10. Conglomerate

This conglomerate has a grey to greenish grey colour in its outcrops. The clasts range up to 5.0 centimetres in size. They are rounded and consist mainly of feldspar porphyritic andesite. Impure limestone clasts sometimes are found. On cliffs this unit displays very coarse bedding and interfingers with the underlying greywacke.

11. Greywacke

This grey weathering unit has a coarse sandy texture. It is a well sorted rock. The clasts consist of subangular to subrounded andesite rock fragments and subhedral feldspar grains. This sandstone unit interfingers with the overlying conglomerate.

12. Andesitic tuff

Although fresh surfaces of this andesitic rock are dark green in colour, weathered outcrop surfaces have a rusty brown, greyish green and brownish grey colour. The tuff has small clasts of crystal and lithic tuff and occasional black mudstone. The clasts vary from 0.5 to 5.0 millimetres in size. The rocks are locally magnetic.

2.4 ALTERATION

A central potassic alteration zone is surrounded by concentric zones of argillic, phyllic and propylitic alteration.

2.4.1 Propylitic Alteration

Most of the andesites on the property are dark green in colour due to extensive chlorite alteration. The strongest chlorite mineralization lies just outside the area of phyllic alteration, but it is also noticeable across the entire property as an early phase within the argillic and potassic zones. Some of the chlorite alteration outside of the area of intense hydrothermal alteration may be due to a regional lower greenschist metamorphism of the surrounding rocks.

The most intense chlorite alteration was observed in outcrops lying between Big Red Hill and Little Red Hill, just peripheral to the extensive phyllic altered zone. Within the propylitic alteration zone, the main alteration minerals are chlorite, epidote and pyrite. Petrographic descriptions of rocks from this zone (89T101 and DDH75-2 695') have identified up to 10% chlorite, 1% epidote and 4% pyrite in the rocks.

2.4.2 Phyllic Alteration

Phyllic alteration, distinguished by extensive sericite, pyrite and silica mineralization forms distinctive gossanous outcrops on the property. Outcrops have a bleached and rusty appearance. Sericite mineralization averages 10% although one sample (89T208) contained 25% sericite. The pyrite content ranges up to 5%, mainly as disseminations but also as fracture fillings. Certain outcrops show extensive, pervasive silicification.

Samples from within the phyllic zone are described petrographically in Appendix No. 2. These samples, 89T22, 89T34, 89T60, 89T93, 89T108, 89T109, are primarily taken from more competent,less altered rock and are not representative of the intensely altered rock seen in outcrop. Sample 89T208 better represents the strong sericitization observed in outcrop.

Phyllic alteration south of the Camp Zone is best observed at Big Red Hill and Little Red Hill,where the rocks are bleached and gossannous. These rocks were often mapped incorrectly as their original lithology is difficult to recognize as the volcanic and sedimentary textures were completely destroyed by the alteration. Previous mappers called these rocks "felsite". The Red Hills are quite resistant to erosion due to the prevalence of quartz veinlets in the rocks.

West of the Camp Zone, the phyllic zone is observed in cliffs between Fossil Creek and Upper Dyke. At this location, Unit 2 rocks are strongly silicified and pyritized.

North of the Camp Zone, the phyllic alteration is seen in the two northernmost outcrops of Upper Dyke and on outcrops in Camp Creek.

East of the Camp Zone, the phyllic alteration occurs in an outcrop 300 metres northeast of camp. The bleached and gossanous cliffs at the 1100 metre elevation in Middle Creek and the north arm of Knob Creek may also be as a result of phyllic alteration.

2.4.3 Argillic Alteration

Argillic (clay) alteration was only recognized in drill core (holes DDH73-3 and DDH75-3), not in outcrop. It consisted of pervasive alteration of the original plagioclase to a soft earthy white clay material, probably kaolin. At Ball Creek, the argillic alteration occurs within and immediately surrounding the zone of intense potassic alteration.

2.4.4 Potassic Alteration

Potassic alteration in the form of pink potash feldspar envelopes around fractures and quartz veins was noted in drill core from holes DDH73-2, DDH73-3, DDH75-3 and DDH75-5. In some of the drill holes, sections originally logged as being intensely silicified, were actually showing pervasive potash feldspar alteration. These rocks contain up to 70% potash feldspar primarily as introduced material. Potassic alteration is accompanied by a significant increase in magnetite content.

Several outcrops within the area of previous drilling also showed extensive pink potash feldspar envelopes. Outcrops are too strongly weathered to recognize the potash feldspar flooding of rocks. The areas of potassic alteration have been noted on the geology map.

The rock samples showing potassic alteration are 89T72, 89T73, 89T83B, DDH73-2 463.5' and DDH75-5 145'; these are described in Appendix No. 2.

2.5 MINERALIZATION

Sulphide mineralization on the property occurs in a similar pattern to that associated with porphyry copper-gold deposits described in the literature. A pyrite halo surrounds Camp Zone chalcopyrite-molybdenite mineralization. Peripheral to the annular pyritic zone, galena and sphalerite mineralization occur in carbonate veins. Chalcopyrite mineralization is widespread on the property, primarily located within the Camp Zone but also found peripheral to the pyrite zone. Molybdenite was observed within the Camp Zone and in the Cliff Zone.

2.5.1 Pyrite

The most intense pyrite mineralization occurs within the phyllic alteration zone surrounding the Camp Zone stock. The type locations for this quartz-sericite-pyrite mineralization are Big and Little Red Hills. The outer periphery of the gossans about the Camp Zone can be considered to be the outer periphery of the pyrite halo. The pyrite halo shows as a chargeability anomaly around and within the Camp Zone. Though the most intense pyrite coincides with the phyllic alteration zone, pyrite mineralization as expressed by gossans, appears to extend somewhat farther outward from the Camp Zone.

Within the Camp Zone and in the phyllic zone, pyrite occurs most abundantly in fractures and quartz veinlets in andesites. Lesser amounts of pyrite occur as blebs and disseminations in andesites and monzonites, usually near intrusive contacts or faults. Unaltered andesites and monzonites normally contain less than 1% disseminated pyrite.Outside of the Camp Zone, pyrite mineralization is confined to fractures and quartz veinlets in the fault zones.

Pyrite mineralization at the Goat Zone is only found along the cliff faces formed by the Ball Creek Fault. The sulphide mineralization is restricted to the fault trace and is not as extensive as it appears on surface. Pyrite, galena and sphalerite occur within quartz carbonate veins in the Goat Zone Fault.

Sheared rocks exposed along the Cliff Zone Fault in East Cliff Creek are very pyritic. One brecciated section of fault carries 30% pyrite as its matrix.

2.5.2 Copper Minerals

Chalcopyrite occurs in quartz veinlets and as blebs in fault breccias in the Goat Zone and Cliff Zone. Small specks of chalcopyrite can be seen in andesitic float in the Camp Zone near DDH75-5. Minor amounts of chalcopyrite were also observed in quartz veinlets in drill core.

Malachite is a common occurrence on the rusty outcrops along Camp Creek. Occasional pieces of andesite float from the Camp Zone and Cliff-Knob Creek fault zone contain specks of malachite on weathered surfaces.

2.5.3 Molybdenite

Molybdenite occurs in quartz veinlets and fractures in fault breccias along the Cliff Zone. Small specks of disseminated molybdenite were observed in monzonite drill core.

2.5.4 Lead and Zinc Minerals

Galena and sphalerite occur within narrow carbonate veins in the Goat Zone and at Border Creek. Some of the quartz veinlets in the Goat Zone also carry small amounts of galena.

2.5.5 Magnetite

Magnetite is a common alteration mineral in the potassic alteration zone. Accompanying the potash feldspar selvages around quartz veins over the Camp Zone, magnetite forms up to 5% of the rock. The ground magnetic survey defines the potassic zone as distinct circular magnetic high surrounded by an annular ring of low magnetism. Magnetite is also common in many of the younger volcanic rocks on the property, primarily the trachyandesite and the basalt.

2.5.6 Gossans

A distinct rusty gossan overlies the Camp Zone mineralization and the surrounding area of phyllic alteration. This gossan extends north to Border Creek, west to the cliffs along Fossil Creek, east to the 1080 metre elevation and south to Big and Little Red Hills.

A spectacular gossan is seen along the cliffs of the Goat Zone. The Cliff Zone gossan is bounded on the west by West Cliff Creek and on the south by the Cliff Zone Fault. A 150 metre wide zone of rusty talus marks the trace of this fault into Knob Creek.

Rocks in the upper parts of Knob Creek, Middle Creek, Camp Creek and Fossil Creek are very rusty due to concentrations of pyrite within the faults crossing the creeks.

2.5.7 Quartz and Carbonate Veins

Quartz stockworks were observed at two localities in the central Camp Zone. Quartz veins up to 1.5 centimetres wide give the stockwork zone a quartz content of 20 to 50 percent. Drill core from the Camp Zone showed that the quartz veinlets occur mainly in andesites. Veinlets are less common in the more massive monzonites. The veinlets are usually smaller than 1.0 centimetre wide. These veinlets carry very few sulphides. Quartz and carbonate veins up to about 3.0 centimetres wide occurs in fault breccias in the Goat Zone and the Cliff Zone. The quartz veins occasionally contain minor amounts of sulphides. Carbonate veins occur mainly in the Goat Zone. The Border Creek showing and other fault zones over the property also contained some carbonate veins.

2.6 STRUCTURAL GEOLOGY

Two main structural patterns occur as faults on the property; east-west and north-south. The east-west structural direction has a bearing of 060° and is seen in the following faults: Ball Creek fault, Cliff Zone Fault, Barren Fault, North Arm Fault and Middle Creek Fault. The north-south structural direction bears 330° and is seen in the following faults: Devil's Creek fault, South Zone Fault, Goat Zone Fault, Camp Fault and Fossil Creek fault.

The north-south faults cause a right lateral displacement of some of the east-west structures. The apparent bending of Barren Fault, North Arm Fault and Middle Creek Fault at their intersections with Camp Fault may be caused by right lateral movement along this and other north-south structures.

3.0 SURVEY CONTROL

A 52 kilometre grid was located on which soil sampling, magnetics and VLF EM surveys were performed. A baseline bearing 055° was cut and marked at 25 metre intervals with wooden pickets. The baseline was established as line 2000 south. Grid lines, bearing 145° were located by chain and compass and marked by flagging tape. The lines were located at 100 metre intervals with stations marked at 20 metre intervals. The grid extended from lines 200 W to 2800 W and stations 600 S to 4400 S.

4.0 GEOCHEMISTRY

4.1 SOILS

4.1.1 Sample Collection, Preparation and Analysis

Soil samples were collected from the flagged grid mentioned in the previous section. The samples were spaced 40 m apart along the lines. A steel mattock, plastic spoon, and kraft paper bag were used to obtain and package the samples. B-horizon soil material was collected from most sites. Sample depth ranged from 20 to 35 cm. Notes on the nature of the sampled soil material and on site conditions were recorded in the field. These notes are presented in Appendix 7.

Soils on the Ball Creek property are quite variable with well developed soil profiles found over the vegetated and lower parts of the property and poorly to moderately developed over the gossanous areas and rocky cliff areas. The soil horizons that have developed are quite thick. In the vegetated areas a 5 to 10 cm A-horizon overlays a narrow 5.0 cm. A_e-horizon. This, in turn, overlays a well-developed B-horizon which can be up to 20 cm thick. In the rusty talus areas where no vegetation will grow, the A-horizon is not present as the surficial soil is a reddish brown B-horizon, up to 30 cm thick, that transforms to an underlying grey to brown C-horizon. The B-horizon, which is the zone of metal accumulation, is medium orange-brown to orange-red in colour depending upon the original pyrite content of the underlying bedrock.

The soil samples were forwarded to the Placer Dome analytical laboratory in Vancouver where they were oven-dried and sieved to produce a -80 mesh fraction. A subsample was weighed for geochemical analysis. Each sample was analyzed for Au, Ag, Cu, Zn, Pb and As. The digestion and detection techniques used for each element are presented in Appendix 4.

4.1.2 Treatment and Presentation of Results

A listing of the analytical results for the soil samples is given in Appendix 5. Basic statistical calculations and histogram plots were employed to examine the structure of the analytical data for each element (Appendix 6). A total of 1337 samples was used in the statistical analysis. Log-transformed data was used for calculation of the correlation matrix and construction of the histograms because a preliminary examination of the raw analytical results indicated that the distributions for each element are lognormal.

The results for all of the metals are plotted on 1:5000 scale maps which are appended in pockets at the back of the report. Zones of anomalous metal content are outlined on each map.

4.1.3 Discussion of Results

Gold (Figure 6)

Gold analyses for the soil samples ranged from <5 to 2,165 ppb Au. A cumulative frequency plot showed two inflection points suggesting three populations; less than 65 ppb Au (background), 65 - 160 ppb Au (anomalous), and greater than 160 ppb Au (highly anomalous). For simplicity sake a compromise of 80 ppb Au was used as a contour to delineate anomalous areas on the geochemical map. A total of 80 samples was found to be highly anomalous. Most of these samples were taken from the Camp Zone or just down-hill from the Camp Zone. Some of the very anomalous samples were taken from the trace of Camp Fault.

Copper (Figure 7)

Copper analyses for the soil samples ranged from 5 to 3,900 ppm Cu. A cumulative frequency plot showed two inflection points suggesting three populations; less than 80ppm Cu (background), 80 - 165 ppm Cu (anomalous), and greater than 165 ppm Cu (highly anomalous). For simplicity sake a compromise of 130 ppm Cu was used as a contour to delineate anomalous areas on the geochemical map. A total of 150 samples was found to be highly anomalous. Most of these samples were taken from the Camp Zone or just down hill from the Camp Zone. The pattern produced by the anomalous copper samples coincides with the pattern produced by anomalous gold. Some of the very anomalous samples were taken from the trace of Camp Fault.

Molybdenum (Figure 8)

Molybdenum analyses for the soil samples ranged from 1 to 200 ppm. A cumulative frequency plot showed two inflection points suggesting three populations; less than 6.4 ppm Mo (background), 6.4 - 20 ppm Mo (anomalous), and greater than 20 ppm Mo (highly anomalous). For simplicity sake a compromise of 8.0 ppm Mo was used as a contour to delineate anomalous areas on the geochemical map. A total of 54 samples was found to be highly anomalous. Except for a few samples taken in the Goat Zone all of the anomalous samples formed a target over the Camp Zone. This target generally coincided with the gold and copper pattern except that it was more restricted in extent.

Arsenic (Figure 9)

Arsenic analyses for the soil samples ranged from 1 to 200 ppm As. A cumulative frequency plot showed three inflection points suggesting four populations; less than 30 ppm As (background), 30 - 90 ppm As (anomalous), 90 - 180 ppm As (very anomalous), and greater than 180 ppm As (highly anomalous). A total of 67 samples was found to be highly anomalous. Most of the anomalous samples are related to the Cliff Zone Fault system, peripheral to the main Camp Zone porphyry system. The anomalous arsenic, along with gold and copper in the Cliff Zone fault suggests that structurally controlled vein mineralization also occurs.

Silver, Lead, Zinc (Figures 10.11,12)

Silver, greater than 1.2 ppm; lead, greater than 55 ppm and zinc, greater than 200 ppm form coincident anomalies along the Cliff Zone Fault. This anomalous pattern coincides with the arsenic pattern along the same fault zone. The Camp Zone has very low levels of all three metals.

4.1.4 Interpretation of Results

The Ball Creek Property has a core of anomalous molybdenum soil geochemistry, overprinted with a broader dispersed pattern of anomalous copper and gold geochemistry. Peripheral to the copper and gold anomalies, structurally controlled arsenic, silver, lead and zinc soil geochemical anomalies occur. This metal pattern agrees with the alteration pattern where the molybdenum anomaly lies primarily on the zone of potassic alteration; the copper-gold anomaly covers the potassic and phyllic alteration zones whereas the other base metals are only anomalous over the propylitic alteration zone. The metallogenic patterns developed by the soil sampling are consistent with the classical metal zoning patterns around porphyry copper-gold deposits.

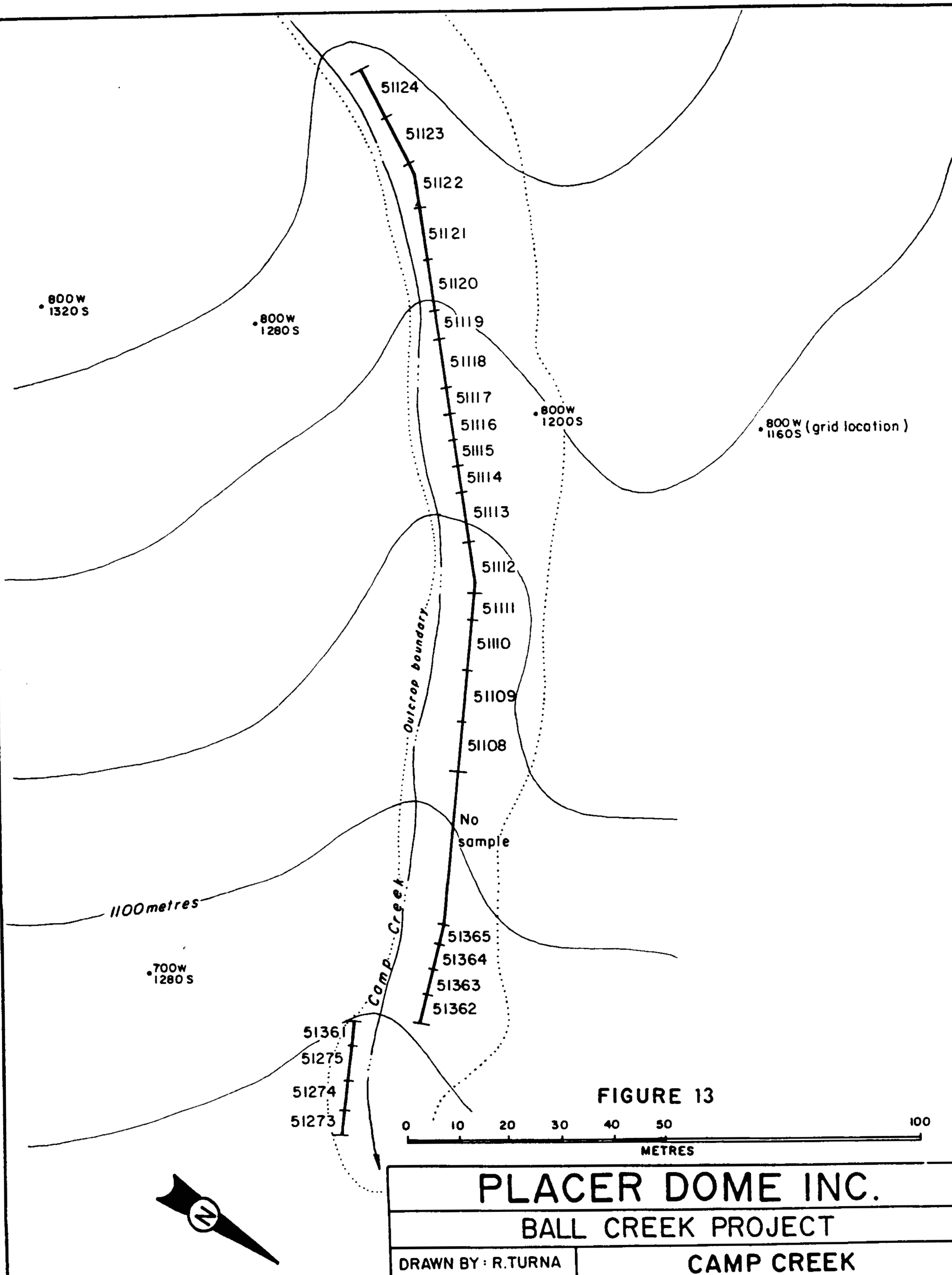

FIGURE 13

CONTOUR INTERVAL 20 METRES

PLACER DOME INC.

BALL CREEK PROJECT

DRAWN BY: R.TURNA	CAMP CREEK ROCK SAMPLE LOCATIONS AND SAMPLE NUMBERS
DATE: NOV. 1989	
SCALE 1: 1000	
REVISED:	FILE Nº. 243 104G/8W

CHONG

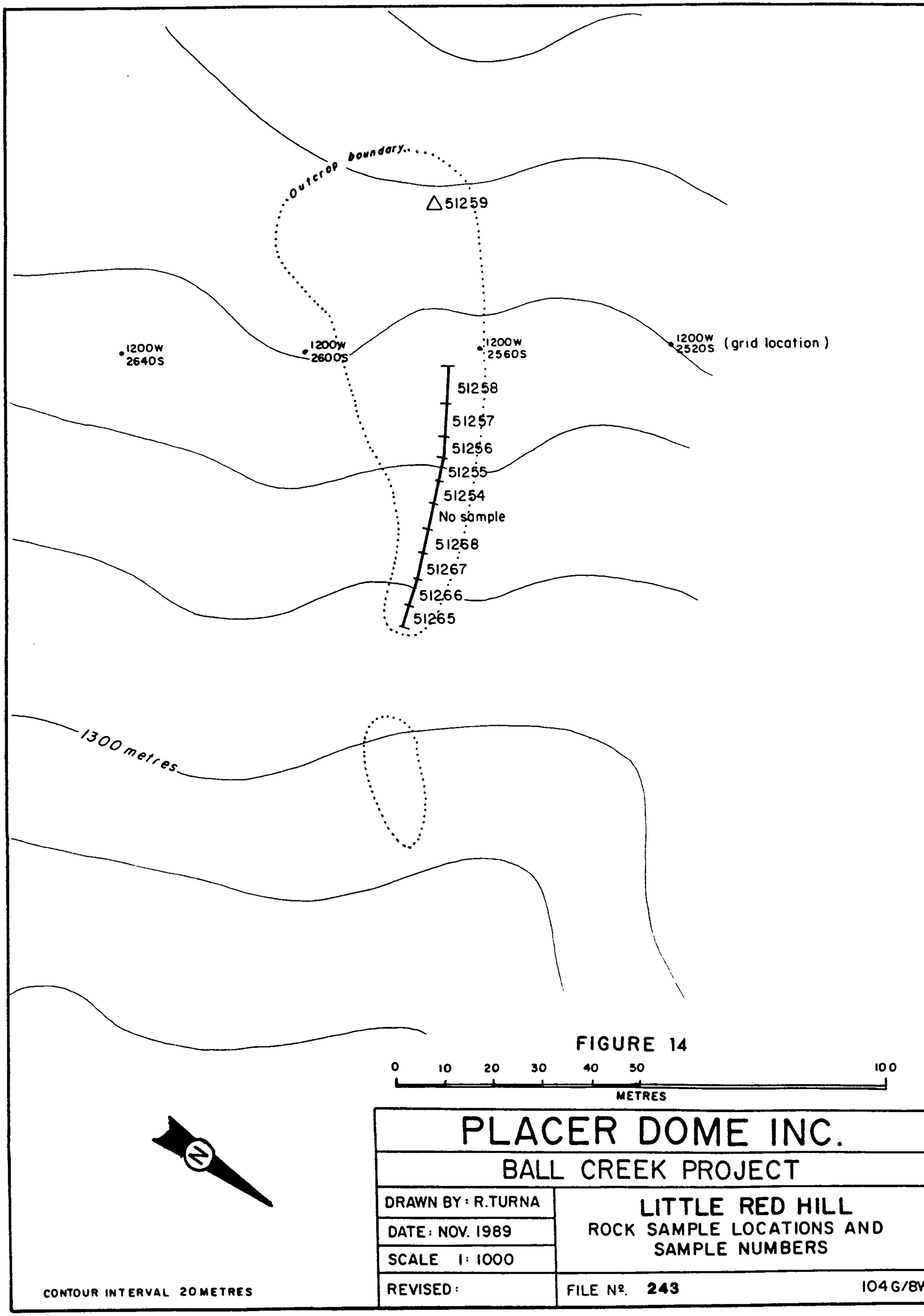

FIGURE 14

PLACER DOME INC.	
BALL CREEK PROJECT	
DRAWN BY: R.TURNA	LITTLE RED HILL ROCK SAMPLE LOCATIONS AND SAMPLE NUMBERS
DATE: NOV. 1989	
SCALE 1: 1000	
REVISED:	FILE Nº. 243 104G/8W

CHONG

4.2 ROCK GEOCHEMISTRY

4.2.1 Sample Collection, Preparation and Analysis

Grab samples were collected from all mineralized sections of outcrop and from mineralized float samples. The samples were analyzed for gold, silver, copper, zinc, lead and arsenic.

Lines of chip samples were collected from gossanous outcrops and all large areas of mineralization. Samples were collected at one metre intervals, along lines 5 to 20 metres long. Sample lines were oriented to cut any mineralized structures at right angles.

The rock samples were sent to the Placer Dome laboratory for analysis. The samples were crushed and pulverized; a subsample weighed, digested, and finally analyzed for Au, Ag, Cu, Zn, Pb and As. The digestion and detection techniques used for each element are presented in Appendix 4.

4.2.2 Treatment and Presentation of Results

A listing of the analytical results for the rock samples is given in Appendix 5. Geochemical results for the chip samples taken on Little Red Hill and along Camp Creek are tabulated on Table 3 and plotted on Figures 13 and 14. The sample locations are plotted on the Geology Map (Figure 5). The various rock geochemical results are plotted as triangular symbols on the various soil maps.

The small number of samples precludes a statistical treatment of the analytical data; only a visual inspection is possible.

4.2.3 Discussion of Results

Chip samples taken from Little Red Hill carry slightly elevated levels of copper and gold. Anomalous values of gold range from 100 to 200 ppb Au, while anomalous values of copper range from 300 to 500 ppm Cu. These samples were taken from the most intense part of the gossan produced by the heavy pyrite mineralization of the phyllic alteration zone. The tenor of these anomalous values are conformable to the range of expected geochemical values for this mineralized zone.

Chip samples taken along Camp Creek located a seven metre zone averaging 250 ppb Au and 1300 ppm Cu. These samples have also been taken from a gossanous pyrite rich segment of the phyllic alteration zone. Other than gold and copper no metals are considered significantly anomalous.

Analyses of grab samples from various parts of the property produced no surprisingly high results. Samples taken of mineralization at the Cliff Zone and Border Creek produced high lead-zinc-silver analyses as was expected. Gold results were elevated (greater than 50 ppb), however no ore grade assays were encountered.

TABLE NO. 3

Geochemical Results from Rock Sampling at Little Red Hill and Camp Creek

Little Red Hill

SAMPLE	Ag PPM	As PPM	Au1 PPB	Cu PPM	Mo PPM	Pb PPM	Zn PPM
51256	1.6	16	100	352	9	13	58
51254	1.0	13	40	460	6	35	82
51255	2.1	20	90	510	10	10	54
51257	1.2	26	70	228	10	14	35
51258	0.9	17	215	83	10	17	21
51259	0.8	26	110	48	8	69	30
51265	<0.2	8	<5	20	3	27	48
51266	0.5	8	40	71	7	41	49
51267	1.5	28	100	258	12	26	30
51268	3.0	44	110	272	13	23	30

Camp Creek

SAMPLE	Ag PPM	As PPM	Au1 PPB	Cu PPM	Mo PPM	Pb PPM	Zn PPM
51108	0.3	4	60	216	20	7	30
51109	0.3	5	90	228	21	8	20
51110	0.4	4	125	200	28	15	20
51111	0.2	3	75	204	12	12	26
51112	<0.2	3	40	204	6	8	32
51113	<0.2	3	100	235	3	4	52
51114	<0.2	<2	20	1430	3	3	73
51115	<0.2	<2	90	1300	11	7	54
51116	0.2	2	60	1020	7	8	48
51117	0.3	<2	60	500	24	9	35
51118	0.2	4	135	1320	7	5	66
51119	1.1	2	425	1330	81	13	41
51120	0.8	3	455	1410	35	8	49
51121	0.7	<2	290	1410	12	7	53
51122	2.2	2	250	1140	68	12	26
51123	1.0	8	250	1250	27	11	34
51124	0.8	4	140	1920	130	7	21
51273	0.2	5	45	128	5	13	42
51274	0.5	8	50	198	8	30	46
51275	<0.2	<2	20	128	5	11	43
51361	0.2	3	50	150	9	12	26
51362	0.2	<2	10	86	44	13	20
51363	0.2	5	45	128	7	42	65
51364	0.2	7	40	140	6	8	25
51365	0.3	<2	90	187	5	14	35

4.3 CORE SAMPLING

Core from the 1973 and 1975 drill programs was examined. The core was relogged and 280 samples were taken and fire assayed for gold and analyzed for arsenic.

4.3.1 Sample Collection, Preparation and Analysis

After the core was logged, 280 mineralized samples were selected for analysis. Ten foot sections of core were either split in half or into quarters using a Longyear style core splitter. The sample was placed in a plastic sample bag, labelled and sent to the Placer Dome assay laboratory in Vancouver. At the laboratory, the sample was crushed and pulverized and a 30 gram split was fire assayed for gold. A smaller split was analyzed for arsenic. The sample preparation and assay procedures are described in Appendix 4.

4.3.2 Treatment and Presentation of Results

Copies of the drill logs are appended in Appendix 3. A table of the drill hole intersections with their respective sample numbers and gold and arsenic analyses is also located in Appendix 3.

4.3.3 Discussion of Results

Intersections of anomalous gold results are presented on Table #4.

TABLE #4

DDH	From	To	Length Represented Feet	Average Au (ppm)
73-1	260	417	157	0.17
73-2	6	572	566	0.37
73-3	20	50	30	0.20
	250	330	80	0.20
	440	770	330	0.27
75-1	30	180	150	0.19
75-2	30	50	20	0.40
	490	720	230	0.17
75-5	50	110	60	0.38
	260	300	40	0.17

Gold values for DDH 73-1 average less than 0.1 ppm Au over the first 260 feet. From 260 feet to 417 feet it averages 0.17 ppm Au. No obvious reason for this increase in gold values was observed in the core logs. The contact between the quartz monzonite and the altered andesite was observed at 380 feet.

Hole DDH73-2 was drilled completely in andesite. Gold values were uniformly high throughout the hole. Pink potash feldspar and magnetite alteration associated with quartz veins were observed in this hole.

Hole DDH73-3 alternately passed through quartz monzonite (Upper Dyke) and andesite. The top 200 feet of the hole is unmineralized and shows very little alteration. There appears to be a positive correlation between intensity of potassic alteration and gold content. In general, the andesite shows more intense potassic alteration than does the quartz monzonite.

Core from holes DDH75-1 and DDH75-2 was very pyritic. Several sections also showed extensive silica alteration. Deeper sections of both holes were quite chloritic. Drilling of both holes appeared to pass out of the phyllic alteration zone and into the chloritic zone. No copper mineralization was observed. Gold values were highest where the silicification was less intense. The higher gold values in hole 75-2 appeared to be related to a set of narrow of quartz carbonate veins.

Holes 75-3 and 75-4 cut extensive phyllic and propylitic alteration in the rock. The rocks contain very little gold.

Hole DDH75-5 cut extensive potash feldspar alteration. Higher gold values appeared to be related to areas of higher potassic alteration. The hole was mineralized with chalcopyrite throughout its length.

5.0 GEOPHYSICAL SURVEYS

5.1 Magnetometer Survey

5.1.1 Equipment and Procedure

The magnetometer survey was conducted using two Geometrics G-856A portable proton magnetometers (memory-mags). One was used in the field-mode while the other was used in a base-station mode. The internal clocks were synchronized before commencement of the survey, and subsequent daily readings were dumped out onto a Zenith microcomputer. The data from the two magnetometers was merged and corrected for diurnal drift from an established base station value. The corrected results were plotted as field profiles and also stored on disk for eventual transfer to a Sun Microsystems work station for final plotting.

Magnetic readings were taken at 12.5 metre intervals along the grid lines. The geophysical operator, wearing the sensor in a harness on his back, always faced north along the line while he took the readings.

5.1.2 Presentation of Survey Results

The magnetometer survey results were plotted as a plan map of contoured data at a scale of 1:5000 (Figure 16). In order to minimize the effect of noisy surface data the magnetic data was filtered to reflect readings taken 20 metres above the ground.

5.1.3 Magnetic Results

The most significant feature is a strong magnetic anomaly over the Camp Zone. The anomaly dimensions are 600 metres by 500 metres. This is a response to the magnetite in the potassic alteration zone. The phyllic alteration zone is expressed as a large magnetic low, where all the original magnetite in the rocks has been destroyed by the hydrothermal event. The propylitic zone, an area of hornfelsing, shows up as a magnetic high. Much of the original magnetite in the volcanic rocks was preserved, and in some cases thermal alteration changed the pyrite into pyrrhotite. Magnetic highs in the north-west part of the property are a result of magnetite rich basalts.

5.2 VLF-EM

5.2.1 Equipment and Procedures

The VLF-EM survey employed a Geonics EM-16 which was tuned to the Annapolis transmitting station. The VLF EM readings were taken at 25 metre intervals along the surveyed grid with the operator facing to the north. The readings were entered onto the Zenith portable computer and plots were made of the In-phase, Quadrature and Fraser Filter data. The Fraser Filter data was calculated as per the method put forth by D.C. Fraser (1969, Contouring of VLF-EM data: Geophysics, v.34, p. 958-967). The stored data was transferred to a Sun Microsystems work station for final processing and plotting.

5.2.2 Presentation of Survey Results

The VLF-EM survey results were plotted as stacked In-phase, Quadrature and Fraser Filter profiles on a plan map at a scale of 1:5000 (Figure 15).

5.2.3 VLF Results

Examination of the line profiles indicate anomalies that may be explained in detail only with very specific application of local topographic and geologic factors. VLF conductors locate all the major east-west trending faults, particularly Barren Creek and Middle Creek Faults. Most of the north-south faults trend parallel to the lines and were not picked up as conductors.

5.3 Induced Polarization Survey

The Induced Polarization (IP) survey was performed over 20 kilometres of the grid. The survey measured four separations of electrodes with the "a" spacing between electrodes set at 60 meters. The program was performed by geophysical contractor, Peter E. Walcott and Associates, who produced a report describing the equipment, procedure and results, including 1:5000 scale maps of resistivity and chargeability. This report is included as Appendix 1.

6.0 CONCLUSIONS

The various exploration techniques utilized in 1989 supported each other in describing a classical porphyry copper hydrothermal event. The geological mapping outlined a roughly concentric set of alteration assemblages, starting with a central potassic zone, then a patchy phyllic zone and finally an extensive propylitic zone. Soil geochemistry located a molybdenum anomaly over the central potassic zone; anomalous gold and copper covering the area between the potassic and phyllic zones and anomalous lead-zinc-silver in the outlying propylitic zone. Magnetics mapped the high magnetite content of the potassic zone and the accompanying magnetite depletion over the phyllic zone. Induced polarization mapped the high chargeability over the potassic and phyllic zones. The sericitic alteration of the phyllic zone was shown by the low resistivity.

The 1989 program also confirmed the conceptual idea that the Ball Creek deposit could be a gold-bearing copper porphyry. Gold geochemistry in both soils and drill core showed the anomalous precious metal content of this deposit.

The 1989 field program outlined a gold bearing porphyry copper deposit 1500 metres by 1000 metres in dimensions. Drilling in 1990 is required to determine whether this deposit has sufficient copper and gold grades to make an economically viable mine.

SUBMITTED BY:

John Kowalchuk

John M. Kowalchuk

Rein Turna

Itemized Cost Statement
Ball Creek Project

	Cost $
Personnel:	
John Kowalchuk (overall supervision)	
10 days @ 269/day	2,690
Rein Turna (project geologist)	
(on site) 78 days @ 269/day	20,980
(report preparation) 46 days @ 269/day	12,380
Cathy Capell (geologist)	
40 days @ 249/day	9,960
John Basil (geologist)	
37 days @ 120/day	4,440
Henri Letient (geophysicist)	
12 days @ 197/day	2,360
Keith Everard (geophysicist)	
12 days @ 197/day	2,360
Coral Knight (Cook)	
79 days @ 130/day	10,270
John Taylor (technician/survey control)	
(on site) 79 days @ 177/day	13,960
(report preparation) 20 days @ 177/day	3,540
Dave Rawlek (geology student/sampler)	
58 days @ 141/day	8,180
Jean-Pierre Jutras (geology student/sampler)	
57 days @ 118/day	6,730
Todd Hagerman (geology student/sampler)	
47 days @ 141/day	6,630
Adrienne Ross (geology student/sampler)	
47 days @ 128/day	6,016
Andy Knight (sampler & cook's helper)	
17 days @ 90/day	1,530
Expediting Services	7,860
Camp operations	56,000
Office Supplies	350
Equipment Purchases	7,550
Communications	2,920
Vehicle Expense	11,840
Helicopter:	47,270
Freight:	2,310
Assay & Geochem Analyses	24,300
Contract Geophysics	24,100
Linecutting	4,500
Air Travel Fares:	3,430
Reproduction Services:	800
Computer Usage:	660
Orthophoto Map:	8,000
Petrographic Studies:	2,500
TOTAL	**$316,380**

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Visagie H.M. 1974: Great Plains Development Company of Canada Ltd. Ball Creek Year End Report, British Columbia, NTS: 104G/8

Woodcock J.R. 1980: Ball Creek Prospect for GRC Exploration Company.

Woodcock J.R. 1981: Ball Creek Project for GRC Exploration Company

I, Rein Turna, state that:

1. In graduated from the University of British Columbia in 1975 with a BSc. in Geology.

2. Since 1975 I have been engaged in mineral exploration in British Columbia and Yukon Territory.

3. I have been personally engaged in field work on the Ball Creek project and am responsible for the interpretation of data included in this report.

4. My business address:

Placer Dome Inc.
#1500-1055 Dunsmuir Street
Vancouver, B.C.
V7X 1P1

My home address:

5818 Falcon Road
West Vancouver, B.C.
V7W 1S3

Rein Turna

Rein Turna

Statement of Qualifications:

I, John Kowalchuk, state that:

1. I graduated from McMaster University, Hamilton, Ont. with a Batchelor of Science degree in Geology in 1970.

2. Since 1970, I have been engaged in mineral exploration throughout Canada. Most of this time has been spent working in British Columbia and the Yukon Territory.

3. I supervised the work performed by Mr. Turna and the field crews of Placer Dome Inc. I participated in the interpretation of the data and the writing of this report.

4. My business address is:

   Placer Dome Exploration Limited
   103 Platinum Road,
   Whitehorse, Y.T.
   Y1A 5M3

5. My home address is:

   3086 Mariner Way,
   Port Coquitlam, B.C.
   V3C 3T3

John Kowalchuk

4000 E
4500 E
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Base-Line
GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 0 100 (metres) 200 300 400
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
1ST SEPARATION CHARGEABILITY CONTOURS
Contour Interval 2 millivolts/v, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-1
Date: December 1989
Peter E. Walcott & Assoc. Ltd.

4000 E
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Base-Line
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plot point
GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 0 100 (metres) 200 300 400
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
2ND SEPARATION CHARGEABILITY CONTOURS
Contour Interval 2 millivolts/v, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-2
Date: December 1989
Peter E. Walcott & Assoc. Ltd.


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GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 (metres) 200
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
3RD SEPARATION CHARGEABILITY CONTOURS
Contour Interval 2 millivolts/v, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-3
Date: December 1989
Peter E. Walcott & Assoc. Ltd.


4000 E
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GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 0 100 (metres) 200 300 400
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
4TH SEPARATION CHARGEABILITY CONTOURS
Contour Interval 2 millivolts/v, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-4
Date: December 1989
Peter E. Walcott & Assoc. Ltd.


4000 E
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GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 0 100 (metres) 200 300 400
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
FILTERED CHARGEABILITY CONTOURS
Contour Interval 2 millivolts/v, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-5
Date: December 1989
Peter E. Walcott & Assoc. Ltd.

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Base-Line
GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1
OF 2
SCALE 1 : 5000
100 (metres) 200
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
1ST SEPARATION RESISTIVITY CONTOURS
Contour Interval 100 ohm-ms, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-6
Date: December 1989
Peter E. Walcott & Assoc. Ltd.


GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1
OF 2
SCALE 1 : 5000
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
2ND SEPARATION RESISTIVITY CONTOURS
Contour Interval 100 ohm-ms, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-7
Date: December 1989
Peter E. Walcott & Assoc. Ltd.
Base-Line
4000 E
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GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
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48000 N
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Base-Line
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L 1600 W
L 1800 W
L 2000 W
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L 2400 W
SCALE 1 : 5000
100 0 100 (metres) 200 300 400
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
3RD SEPARATION RESISTIVITY CONTOURS
Contour Interval 100 ohm-ms, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-8
Date: December 1989
Peter E. Walcott & Assoc. Ltd.

GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 (metres) 200
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
4TH SEPARATION RESISTIVITY CONTOURS
Contour Interval 100 ohm-ms, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-9
Date: December 1989
Peter E. Walcott & Assoc. Ltd.
Dipole-Pole Array
plot point
Base-Line
4000 E
4500 E
5000 E
5500 E
50500 N
50000 N
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49000 N
48500 N
48000 N
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GEOLOGICAL BRANCH
ASSESSMENT REPORT
19,316
PART 1 OF 2
SCALE 1 : 5000
100 (metres) 200
Dipole-Pole Array
plot point
PLACER DOME INC.
Pole - Dipole
INDUCED POLARIZATION SURVEY
FILTERED RESISTIVITY CONTOURS
Contour Interval 100 ohm-ms, a = 60 ms.
Ball Creek Project
Liard M.D., B.C., N.T.S. 104 G/8
August 1989
Map No. W-457-10
Date: December 1989
Peter E. Walcott & Assoc. Ltd.
Base-Line
4000 E
4500 E
5000 E
5500 E
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