GEOLOGICAL REPORT ON THE HIGHLAND VALLEY PROPERTY

HIGHLAND VALLEY AREA, BRITISH COLUMBIA

[ASSESSMENT REPORT]

PREPARED FOR GARY ROBERT BROWN

Latitude 50°15' – 50°23' N; Longitude 120°47' – 120°57' W

NTS Map Number 92I36 (Chataway Lake Sheet)

By

William R. Bergey, P.Eng.
Consulting Geologist

July 22, 2009
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION AND TERMS OF REFERENCE</td>
<td>1</td>
</tr>
<tr>
<td>PROPERTY DESCRIPTION AND LOCATION</td>
<td>1</td>
</tr>
<tr>
<td>LOCATION, ACCESS, CHARACTER OF THE REGION</td>
<td>4</td>
</tr>
<tr>
<td>HISTORY</td>
<td>6</td>
</tr>
<tr>
<td>SCOPE OF THE WORK</td>
<td>10</td>
</tr>
<tr>
<td>GEOLOGICAL SETTING</td>
<td>11</td>
</tr>
<tr>
<td>Regional Geology</td>
<td>11</td>
</tr>
<tr>
<td>Geology of the Guichon Creek Batholith</td>
<td>14</td>
</tr>
<tr>
<td>Regional Faulting</td>
<td>16</td>
</tr>
<tr>
<td>Property Geology</td>
<td>17</td>
</tr>
<tr>
<td>REGIONAL MINERALIZATION MODEL</td>
<td>31</td>
</tr>
<tr>
<td>DISCUSSION OF THE RESULTS OF THE WORK</td>
<td>34</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>37</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>44</td>
</tr>
<tr>
<td>Description of rock samples</td>
<td>44</td>
</tr>
<tr>
<td>STATEMENT OF COSTS</td>
<td>48</td>
</tr>
<tr>
<td>STATEMENT OF QUALIFICATIONS</td>
<td>49</td>
</tr>
</tbody>
</table>
ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>TENURES MAP</td>
<td>2</td>
</tr>
<tr>
<td>Figure 2</td>
<td>LOCATION MAP</td>
<td>4</td>
</tr>
<tr>
<td>Figure 3</td>
<td>REGIONAL GEOLOGY</td>
<td>13</td>
</tr>
<tr>
<td>Figure 4a</td>
<td>PROPERTY GEOLOGY (SHEET 1)</td>
<td>19</td>
</tr>
<tr>
<td>Figure 4b</td>
<td>PROPERTY GEOLOGY (SHEET 2)</td>
<td>20</td>
</tr>
<tr>
<td>Figure 4c</td>
<td>PROPERTY GEOLOGY (SHEET 3)</td>
<td>21</td>
</tr>
<tr>
<td>Figure 4d</td>
<td>LEGEND FOR GEOLOGICAL MAPS</td>
<td>22</td>
</tr>
<tr>
<td>Figure 5</td>
<td>AEROMAGNETIC SURVEY</td>
<td>28</td>
</tr>
<tr>
<td>Figure 6</td>
<td>IP SURVEY OF NW PORTION OF CHAT GROUP</td>
<td>37</td>
</tr>
<tr>
<td>Figure 7</td>
<td>COMPARISON OF CHARGEABILITY DATA</td>
<td>38</td>
</tr>
<tr>
<td>Figure 8</td>
<td>ABERDEEN-VIMY-TWILIGHT AREA</td>
<td>40</td>
</tr>
<tr>
<td>Figure 9</td>
<td>PRELIMINARY STREAM-SEDIMENT SURVEY</td>
<td>44</td>
</tr>
<tr>
<td>Figure 10</td>
<td>REGIONAL STREAM-SEDIMENT SURVEY</td>
<td>45</td>
</tr>
</tbody>
</table>
INTRODUCTION & TERMS OF REFERENCE

The present report describes the assessment work that was carried out on the Chat, Skuhun, Tap and Mamit claim blocks, collectively the Highland Valley Property (termed “the Property” hereinafter) owned by Gary Brown. The exploration work described in the report is a continuation of the mapping program commenced in 2006 (Bergey, 2007b; Bergey, 2007c). Geological mapping and photo-geological interpretation were carried out by the writer in conjunction with compilation and re-interpretation of the published information, including more than 40 assessment reports.

Most of the field work was carried out on the Mamit Block, which was acquired by Gary Brown since the earlier work was carried out. Extensive air-photo re-interpretation was done the other claim blocks and on the surrounding region in order to improve the definition of the regional structures that appear to play key roles in controlling the emplacement of the major copper deposits in the Guichon Creek batholith. Some of the information contained in the earlier reports is repeated in order to make the present report more comprehensible.

PROPERTY DESCRIPTION

The Highland Valley Property (“the Property”) comprises 18 unpatented Mineral Tenures covering 9418.21 hectares (about 36 square miles) in the Kamloops Mining Division, British Columbia. The tenures are contiguous except for the small Skuhun Block, which lies west of the other blocks. The locations of the tenures are shown on Figure 1. The National Topographic System designation is 92I36 (Chataway Lake). The centre of the Property is located at Latitude 50°20’N, Longitude 120°53’W.
Ownership of the tenures is held by Gary Robert Brown. There is extensive private ownership of land along the valley of Guichon Creek in the eastern portion of the property. This is shown on Figure 1.

There are no known mineralized zones or mineral resources within the Property whose authenticity has been confirmed by the author.

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</table>
LOCATION, ACCESS, CHARACTER OF THE REGION

The Property lies in the south-eastern part of a high plateau that drops off abruptly toward the Guichon Creek valley to the east. The topography on the plateau is characterized by moderately steep-sided hills with local relief of less than 100 metres except along the western part of the valley of Skuhun Creek, which lies more than 200 metres below the average surface of the plateau. Elevations are highest in the north-western part of the area, averaging more than 1500 metres north and west of Chataway Lake. Mamit Lake, which occupies a portion of the valley of Guichon Creek, lies below 1000 metres.

The north-western portion of the map area falls within the biogeoclimatic zone classified as \textit{Sub-Boreal Spruce}. To the south and east this is replaced by the \textit{Interior Douglas-Fir} zone. In local terms this means that Lodgepole Pine is supplanted as the predominant tree species by Ponderosa Pine along the more arid lower slopes of the Guichon Creek valley. This transition is apparent in the patchwork of clear-cut logging on the plateau — the result of pine beetle infestation of the favoured Lodgepole Pine.

The area is accessible by road from the town of Merritt, which lies 180 kilometres east of Vancouver, and also from the city of Kamloops via Logan Lake townsite and the Highland Valley mining district. The access route from Merritt follows a paved highway for 20 kilometres via Lower Nicola as far as the Tap Group. A network of gravel roads provides access beyond this point to the Chataway and Skuhun Groups. The Merritt-Logan Lake Highway transects portions of the Mamit Group. The local road network is shown on Figure 1. (The roads to Mamit Lake and Chataway Lake are maintained throughout the year).

The map area has a cool-temperate to sub-boreal climate with fairly hot summers and cold winters. Rainfall and snowfall are moderate. Mineral exploration commonly is carried out year-round. Large-scale open-pit mining in the Highland Valley copper has not been unduly hindered by the climatic conditions over the past half a century.
HISTORY

Intensive prospecting was carried out in the late 1800’s within a mineralized trend that I have termed the “Southeast Belt.” It extends for about five kilometres south-southeast from Twilight Lake, which is located in the central part of the Chat Group. Early in the following century attempts were made to mine high-grade copper “veins” that were emplaced along northeast-trending faults and shears at several localities, including the Aberdeen, Vimy and Wiz Mines. More recent exploration work has expanded some of the vein deposits and there is evidence that porphyry-copper type mineralization is present locally in association with the veins.

Intensive modern prospecting activity in the vicinity of the Property commenced once it was recognized that the Bethlehem prospect, located 13 kilometres north of Chataway Lake, contained a porphyry copper deposit that could be mined in a large-scale, low-cost operation. Following the opening of this mine in 1962, major porphyry-copper discoveries were made south of Bethlehem at Lornex, Valley Copper, Highmont and JA. Although cyclical in nature, in phase with metal-price cycles, exploration in the region has been intense since the 1960’s. Highland Valley Copper currently is the largest base-metal mine in Canada, and it is one of the largest in the world in terms of ore treated.

All of the area that encloses the Property has been explored, in many cases by an almost unbroken succession of companies. The following summary lists various exploration programs that have been carried out within and adjacent to the Property. Most of the published information was contained in assessment reports that the B.C. Government has made available on the Internet. Descriptions of mineral occurrences are summarized on Minfile and in publications of the B.C. Geological Survey. The compilation and interpretation of this voluminous data constitute a large portion of the preparatory work for the present report.

The following summary is incomplete. Not all of the published material provided data that I deemed to be significant for the purposes of this report, and not all of the results of the exploration programs in the region were disclosed in published form.
Chat Block

1958:  Craigmont Mines Ltd. carried out a magnetometer survey in the vicinity of the Buck showings (Rennie, 1958). The prospect is located close to the margin of the Guichon batholith in a geological setting deemed to be similar to the Craigmont mine, a recent discovery at the time.

1963:  Geological mapping was undertaken to aid in the interpretation of physical work previously carried out by Chataway Exploration in the south-eastern part of their property (McTaggart, 1963).

1964:  Induced polarization and electromagnetic surveys were carried out within two small areas for Chataway Exploration Co. (Selmer, 1964). Drilling south of Chataway Lake based on these surveys was done later, but no details have been uncovered on the results of this work – although a mineral resource was announced by the company.

1966-67:  A joint exploration program was carried out by Chataway Exploration and Bralorne Pioneer Mines. Most of the work was carried south of the eastern part of the Property but an IP survey extended into Chat Group near Twilight Lake, where a substantial anomaly was detected. The work included 25 percussion drill holes, mainly in the area designated as the No.4 Zone, a part of the Southeast mineralized trend (see Figure 8).

1968:  Geological mapping of the entire Chataway Explorations property was carried out (Meyer, 1969). This work provided a sound geological base for later exploration in the area, and it was particularly important to my photo-geological study since it accurately located most of the outcrops in the western three-quarters of the Chat Block.

1969:  Chisholm Prospection Ltd. carried out geochemical, magnetometer and IP surveys over the area surrounding the Buck prospect, close to the margin of the Guichon batholith (Chisholm, 1969: Prendergast, 1969).

1970:  Asarco carried out a systematic program of percussion drilling on a 1500-foot grid that included 56 shallow holes. In addition, they drilled 9 follow-up holes to somewhat greater depths (Bayley, 1970). Nearly one-half of this drilling was located within the Chat Block.

1971:  Much of the information on exploration work carried out on the Chataway Exploration property is contained in Sanguinetti (1971.)

1972:  Canadian Superior Exploration carried out induced polarization surveys and diamond drilling on parts of the Chataway Exploration property (Brace & Murphy, 1972; Murphy, 1972).

1975:  Yukonadian Mineral Exploration Ltd. carried out a geochemical survey over the Buck prospect-area (McBean, 1975).

1979:  An induced polarization survey was completed west of Chataway Lake for Lawrence Mining Corp. (Mullan & Hallof, 1979).
1986: John Lepinski carried out geological mapping and geochemical rock sampling in an area bordering the Chat Block south of Gypsum Lake (Gower, 1986).

1991: Aucumo Resources carried out stream-sediment sampling and a minor amount of soil geochemical sampling on the CVS Property. This property included the western and central portions of the present Chat Group (Troup, 1992a,b).

1992: Hudson Bay Exploration carried out an extensive induced polarization survey of the CVS Property. This work is particularly relevant to the present report since it gave blanket coverage to the western part of the Chat Block, and it utilized more sophisticated geophysical equipment, to areas that had been surveyed previously in piecemeal fashion (Walcott, 1992).

1998: Tarco Oil & Gas put down two diamond drill holes along the south boundary of the present Chat Group close to Gypsum Mountain (Lindinger, 1998).

**Skuhun Block**

1968: Northwest Syndicate carried out an induced polarization survey within an area along the Skuhun Creek valley that included the present Skuhun Group (Chaplin, 1968).

1969: Tyner Lake Mines Ltd. carried out magnetometer and induced polarization surveys over a block of claims along the eastern margin of the (Cannon, 1969). Canex Placer (Ruck, 1981) tested an induced polarization anomaly located a short distance east of the Skuhun Group. I have been unable to locate detailed information on this work.

1980: Pearl Resources Ltd. drilled eight shallow percussion holes within the area of the present Skuhun Group. (DeLeen, 1980).

1981: Pearl Resources Ltd. drilled eight percussion holes within and east of the present Shuhun Group (Ruck, 1981).

1982: SMD Mining drilled 7 diamond drill holes on the property to test portions of the Skuhun fault within the Skuhun Group (Chan, 1982).
Tap Block

1960: Spokane Syndicate carried out a magnetometer survey southeast of the road junction (Millar, 1960).

1961: Tormont Mines Ltd. carried out magnetometer and IP surveys within the same general area, but it was not possible to define the location on the information provided. (Faessler & Gregotski, 1961).

1962: General Resources Ltd completed three IP lines south of the road junction. (Faessler & Gregotski, 1962).

1965-1969: Carolin Mines Ltd. carried out geochemical soil sampling and geophysical surveying (EM, magnetometer and IP) followed by 3500 feet of diamond drilling in five holes close to Tyler Creek east of the road junction. No records relating to this work have been located.

1970: Lake Beaverhouse Mines Ltd. surveyed seven miles of IP southeast of the road junction (Bell &Hallof. 1970). The location is uncertain.

1972: Exel Explorations Ltd. carried out geochemical soil sampling over a large area southwest of the road junction (Hindson, 1972).


1972-74: Sonic Ray Resources Ltd. carried out an IP survey and diamond drilling, mainly along Tyner Creek southeast of the road junction (Cochrane, 1974). This work was a continuation of the exploration carried out by Carolin Mines Ltd. in 1965-69.

1983: Artina Resources completed two diamond drill holes southeast of the road junction. A map showing the locations of an IP anomaly and of a number of previously undocumented diamond drill holes from programs carried out by Carolin Mines and Sonic Ray Resources (1965-74) was included. (Weymark, 1983).

Mamit Block

1959: Northwest Exploration Ltd. (Kennecott) carried out geological mapping, along with local geophysical and geochemical surveying, over a large area that included the northern portion of the Chat Block (Ney, 1959).


1978: Bethlehem Copper Corp. undertook regional geological mapping along the north-eastern margin of the Guichon Creek batholith. The survey area included the northern portion of the Mamit and Chat Blocks (Nethery, 1978).
1980-82: Cominco Ltd. carried out magnetic and induced polarization surveys covering Mamit Lake and a large area to the west. The surveying included the western portion of the Chat Group (Scott, 1980; Stewart, 1981).

1995: Godwin (1995) carried out detailed magnetometer surveying close to the southeast corner of Mamit Lake to improve the definition of a magnetic anomaly outlined in an earlier survey. He noted that two very shallow percussion drill holes had been drilled in this vicinity in 1980, but that there was no published record of the work.

**SCOPE OF THE WORK**

The work described in the present report is a continuation of the program described in previous assessment reports on the Highland Valley Property on behalf of Gary Brown (Bergey, 2007a,b). Like the earlier work it relied on photo-geological interpretation in combination with geological mapping and the re-evaluation of government and mining-company data.

The latest field work, and much of the air-photo interpretation, were carried out mainly within and adjacent to the more recently acquired Mamit Block. This Block follows the Guichon Creek valley, east of the Guichon Creek batholith. Fifty specimens were cut and examined under the microscope.

The photo-geological interpretation of the entire Property was updated to incorporate newly acquired geological information – and the coverage was expanded well beyond that described in the earlier reports. The aims of the updated and expanded photo-interpretation were to refine the proposed depositional model and to provide better definition of the fault pattern.

In the course of the photo-geological interpretation all of the more than 70 “References” noted at the end of this report were consulted -- and many of the contained maps were reduced to a common scale for layering with other data on the evolving base map. Air photographs were examined at scales of 1:75,000 and 1:15,000 at magnifications of 2x and 4x. The interpreted geology was plotted at a scale of 1:20,000.
GEOLOGICAL SETTING

Regional Geology

In terms of base-metal mining, the geological setting in the region between Kamloops and the U.S. border is defined by the outline of Nicola Volcanic Belt (Figure 2). This belt, along with its sedimentary counterpart to the east, is the southern portion of the Quesnellia Terrane, one of the slices of exotic rocks that were accreted to the North American continent during the Mesozoic. The volcanic rocks of the Nicola group apparently contain above average amounts of copper -- and I do not believe that it is coincidental that most of the major copper deposits of British Columbia are found in this terrane and in equivalent exotic terranes to the north. The Highland Valley Property is located within and adjacent to the Guichon Creek batholith which was emplaced in rocks of the Nicola volcanic belt. The geology of the area surrounding the eastern part the batholith is shown in Figure 3.

The Nicola volcanic rocks have been dated as Late Triassic in age. In very late Triassic and early Jurassic time, a large volume of intrusive rock was emplaced in the volcanic pile. The intrusive rocks fall into two groups, based on their chemical compositions, each containing a distinctive type of porphyry copper mineralization.

The largest intrusions, typified by the Guichon Creek batholith, are composed of quartz-rich granitic rocks of the “calc-alkaline” type. The copper deposits associated with this type of intrusion, including the very large mines of the Highland Valley district, often contain molybdenum but are deficient in gold.

Intrusive rock bodies of the “alkalic type” are much smaller on average than the calc-alkaline ones. They are lacking in quartz and, based on my recent work in the region, they include large volumes of previously unidentified intrusive breccia. [I have introduced the term “Alkaline Intrusive Complex” to include a variety of alkaline intrusive rocks and breccias (Bergey, 2007a)]. Copper deposits associated with these rocks often contain significant amounts of gold. Depending on comparative metal prices, gold may be the more important product in some of the deposits. Important mines of this type within the Nicola volcanic belt and its equivalent to the north include Afton, Ajax, Copper Mountain, and Mount Polley.
The alkalic intrusions are generally believed to be coeval with the Nicola volcanic rocks and thus older than the Guichon Creek batholith. However, my work in the region over the past four years strongly indicates that the rocks of the alkalic complex, although similar in average composition to the Nicola volcanic rocks, were intruded following the deformation of the latter -- and after the intrusion of the late Triassic to early Jurassic calc-alkalic rocks, including the Guichon Creek batholith. The proposed revision is of considerable importance within the Mamit Block, where a number of bodies of rock of quartz-poor alkalic intrusive rock are found along the margin of the Guichon Creek batholith and appear to be intrusive into the quartz-rich calc-alkalic rocks of the batholith.

Several volcanic and sedimentary rock units overlie the Nicola group and the associated calc-alkaline and alkaline intrusive rocks. A northwest–trending belt of moderately folded volcanic rocks of the Spences Bridge group of Early Cretaceous age rests unconformably on the south-western margin of the Guichon Creek batholith and on the adjacent volcanic rocks of the Nicola Group. Volcanic rocks correlated with the Princeton group of Eocene age are present south of the batholith. Sedimentary rocks of probable early Tertiary age are preserved in the central portion of the Mamit Lake graben. The volcanic-dominated Kamloops group of Eocene age overlies the northern portion of the Guichon creek batholith and a small remnant is found near Gypsum Lake in the Chat Block. An upper Tertiary(?) clastic sedimentary unit was mapped on the higher parts of the plateau within the Chat Group, and also in fault blocks within the Mamit Lake graben.
Geology of the Guichon Creek Batholith

The Property is located within and adjacent to the south-eastern portion of the Guichon Creek batholith (Figure 3). This very large igneous intrusion is an elliptical body approximately 60 kilometres north-south by 30 kilometres east-west. It was emplaced into rocks of the Nicola Volcanic Belt in several stages, with the oldest intrusive phase located around the periphery and the youngest at the centre of the mass. The following account is based mainly on McMillan (1978) and Casselman et al. (1995).

More than half a century of detailed geological study has resulted in a generally accepted classification of the various phases and phase-varieties of intrusive rocks. Except for the Border Phase, which includes quartz diorite and diorite, most of the rocks in the batholith are mapped as granodiorite, along with lesser amounts of quartz monzonite. [My recent work suggests that at least some of the mafic to intermediate intrusive rocks previously mapped as Border Phase may belong to a younger alkalic intrusive complex, which is interpreted to be widely distributed within the region.] Although important variations in chemical composition are apparent in the laboratory, textural differences play the most significant role in distinguishing phases and varieties in the field. In general, the rocks tend to be porphyritic to some extent; the larger phenocrysts are hornblende, biotite and magnetite. Dike rocks related to the younger phases of the batholith are common and these may extend for considerable distances into the older adjoining phases.

The Border Phase is depicted on government geological maps as a nearly continuous girdle around the periphery of the batholith. It is darker in colour than the later intrusive phases and includes a considerable amount of quartz diorite as well as granodiorite. Rocks that are more mafic in composition, including diorite and gabbro, are present locally along the margin. These rocks are reflected in geophysical surveys as a zone of high magnetic intensity. They are considered by some geologists to be “hybrid” rocks that have consumed quantities of the adjacent Nicola volcanic rock. My mapping in the eastern part of the Property suggests that most of the quartz-deficient rocks in this area are part of a younger alkaline intrusive suite. Because of uncertainties regarding the identification of the various rock types that purportedly make up the Border Phase, it is not distinguished from the Guichon variety on the property geological maps (Figures 4a, 4b and 4c).
The Highland Valley Phase underlies more than half of the exposed area of the Guichon Creek batholith. This phase includes the Guichon variety and the younger Chataway variety as well as various intermediate and more localized varieties. The Guichon variety (along with the Border Phase) underlies the eastern portion of the batholith, including the eastern part of the Chat Block and the western part of the Tap Block. The Chataway variety is present in the central and western parts of the Chat Block.

The Bethlehem Phase of the intrusive sequence is believed to have been coincident with the earliest period of porphyry copper mineralization in the Highland Valley district (Casselman et al., 1995). The outcrop area is confined mainly to a rather narrow strip east of the Bethsaida Phase. However, both field and aeromagnetic evidence suggest that rocks of the Bethlehem phase may be present at depth beneath a large area that extends to the east across the Chat Group and along the Southeast Belt as defined below.

The Bethsaida Phase comprised the final major intrusion that formed part of the central core of the Guichon Creek Batholith. The very large copper and copper-molybdenum deposits of the Highland Valley mining district are enclosed within this core and in the adjacent rocks. The Bethsaida Phase terminates a short distance to the north of the major deposits that it encloses. The Skuhun Group is located astride the southern border of the Bethsaida Phase.

The geochemistry of the rocks in the batholith tends to vary systematically with relative age. For example, silica is lowest in the Border Phase at about 55%, increasing to more than 70% in rocks of the Bethsaida Phase. The reverse is true for copper which decreases dramatically from nearly 100 parts per million in the border phase to less than 10 ppm in some of the Bethsaida Phase rocks (Casselman et al., 1995). This has important implications in the interpretation of geochemical surveys. [It should be noted that the highest copper values and the lowest silica contents occur in rocks that I interpret to be later intrusions.]

The magnetite content of the batholithic rocks varies considerably, even on a local scale. However, there is a systematic variation in the average magnetite content of the rocks from highest at the margin to much lower in the core rocks. Airborne magnetometer surveys tend to smooth out the local variations and show a consistent decline in intensity toward the centre of the
intrusion, with steeper gradients at some of the phase boundaries. Figure 5, taken from a government regional airborne magnetometer survey, illustrates the magnetic pattern in the area covered by the geological map in Figure 3.

**Regional Faulting**

The Guichon Creek batholith is bisected by a major north-south fault designated as the Lornex fault. Apparent horizontal movement along this fault is indicated to be 5 to 6 kilometres in a dextral (east-side-south) sense. This movement has effectively separated the Lornex and Valley orebodies. There has been a significant amount of vertical movement along the fault as well, as attested by the down-dropping of volcanic and sedimentary rocks of the Eocene Kamloops Group along the eastern margin of the Valley orebody. McMillan (1976a) argued that the Valley orebody formed at a deeper level under higher temperature conditions than the Lornex portion of the deposit.

Two other regional faults have been documented in the literature within the central portion of the batholith prior to the present study. The Highland Valley fault; and the interpreted Dupuis Creek fault which joins it at of the widest part of the Highland valley, represent a major east-west structural zone close to the centre of the Highland Valley mining district. The JA copper deposit is elongated parallel to this zone beneath a thick cover of surficial material in the Highland Valley. The Skuhun fault lies 17 kilometres south of the Highland Valley fault. Like the latter, the Skuhun fault trends east-west and is masked in part by a thick cover of overburden within a broad, steep-sided valley. The Skuhun Group of claims follows this valley for a length of nearly three kilometres.

The Guichon Creek valley is located along the eastern margin of the batholith. The conspicuous change in the geology along this linear feature strongly suggests that it follows a major structural zone. This impression is supported by the aeromagnetic data north of Mamit Lake. To the south, the pattern may have been disrupted by the introduction of the Alkalic Intrusive Complex.

Photo-geological interpretation outlined a large number of faults within the portion of the Guichon Creek batholith that includes the Property, most of which were not defined previously. Particularly prominent are swarms of regional faults that trend north-south to north-northwest that have been
traced for 25 kilometres within the batholith (Figure 3). An astonishing number of significant copper occurrences, including all of the major deposits, appear to be associated with regional faults of this orientation. They include the Lornex fault, noted above, which locally followed the older HVC fault. The Highmont orebody is located astride the Highmont fault, which continues to the north where it apparently is associated with the JA, Bethlehem, Krain and South Seas deposits in turn. The Roscoe Lake fault is occupied by two copper prospects south of the lake and extends north to the vicinity of the JA deposit. The former Alwin mine is located adjacent to a north-south fault located west of the Highland Valley copper deposits. The No.4 Zone and the Wiz “mine” south of the Chat Block are associated with south-southwest faults (Figure 8). Farther to the southeast, Dot Resources Ltd. has recently published a copper resource estimate on several zones that are reported to follow “north to northwest regional faults” (Robinson, 2009). The former Craigmont mine is located in volcanic and sedimentary rocks of the Nicola Group adjacent to the contact of the Guichon Creek batholith. Regional faults are interpreted to the north of the mine, but the immediate vicinity is obscured by younger cover.

Property Geology

The following account is not limited to the Property. It includes descriptions of geological features in the surrounding area that are relevant to an understanding of the property geology. Since the four claim blocks that comprise the Property occupy somewhat different geological settings, the bedrock geology and the faulting of each is treated separately in this account. The locations of the property maps (4a,b,c) are shown on Figure 1.

Skuhun Block
The geology of this small block is illustrated on Figure 4a. Portions of the southern margins of the Bethsaida and Bethlehem Phases, the younger units that comprise the core of the composite intrusion, underlie the Skuhun Block. Rock outcrops are very scarce on this claim group which overlaps the widest section of the valley of Skuhun Creek. The north slope of the valley is occupied by thick glacial deposits of the type referred to as “ice-contact features” that were formed as the glaciers melted and retreated. The land forms include eskers, kames and kame terraces. This unit is indicated to be more than 100 metres in thickness in a drill hole put down west of the Skuhun Group. The deepest part of the valley is floored by rather sparse alluvium, and by landslide deposits derived from collapse of the unstable
sand and gravel of adjacent kame terraces. A drill hole in this material within the Property failed to reach bedrock at 50 metres.

The southern contact of the Bethsaida Phase is poorly defined by geological mapping within the Skuhun Block due to the lack of outcrops, particularly in the broad valley. This was remedied to some extent by the results the ground magnetic survey (Cannon, 1969) since the magnetite content of the rocks of the Bethlehem phase is distinctly higher on average than that of the Bethsaida phase. It appears that the south contact extends farther south and east than shown on McMillan (1978). Rocks of the Bethlehem Phase are exposed in outcrops and in drill holes across the central portion of the claims. The Chataway variety of the Highland Valley Phase crops out in the south-eastern corner of the claim group.

The Skuhun Creek fault follows the deep valley of Skuhun Creek in the north-central part of the Block. The fault was conjectured many years ago on the basis of a strong lineament that extends across the entire southern portion of the Guichon Creek batholith. Its age and economic significance are undetermined. However, it parallels the Highland Valley fault, another major structural feature and one that is associated (in space) with the major copper deposits of the Highland Valley -- the JA deposit in particular.

Air-photo interpretation has identified a pair of regional faults that trend south-southeast from the Lornex /Valley deposit(s) and the JA, Highmont and Bethlehem deposits. I have termed these the HVC fault and Highmont fault. The Roscoe Lake fault, situated to the east, also extends into the vicinity of the JA deposit. These three regional faults appear to approach one another a short distance north of the Skuhun Block, but their definition in this area is obscured by deep overburden. The offset of these faults by the Skuhun Creek fault is uncertain, but the indicated offset of the Lornex fault (i.e., south side west) would correlate them with faults shown in the southern part of the Block (Figures 3and 5a).

Regarding the possible economic importance of at least some of the north-trending faults, McMillan (1976b) stated, “By inference they [north- and northwest-trending faults] are assumed to have existed prior to mineralization and to have played a role in initiating the many fractures which were subsequently mineralized to form the [JA] deposit.”
LEGEND FOR GEOLOGICAL MAPS
(Figures 4a, 4b, 4c)

QUATERNARY

- g: Mainly ice-contact deposits & associated landslides; mine-waste deposits
- vb: Valley basalt

TERTIARY

- uTs: Clastic sedimentary rocks
- Tk: Kamloops Group: mainly volcanic rocks [Eocene]
- Tu: Sedimentary rocks of unknown affiliation

JURASSIC

ALKALIC INTRUSIVE COMPLEX

- Jox: Intrusive breccia
- Ju: Undifferentiated alkaline intrusions, mainly intrusive breccia
- Jg: Diorite, gabbro

LATE TRIASSIC AND/OR EARLY JURASSIC

CAK-ALKALINE INTRUSIVE ROCKS

Guichon Batholith
- TJG6: Bethsaida Phase
- TJG7: Bethlehem Phase
- TJGc: Chataway Variety
- TJGd: Guichon Variety & Border Phase

Marginal Intrusions
- TJcL: Gump Lake Intrusion
- TJcC: Jesse Creek Intrusion

TJd: Metamorphosed intrusive & sedimentary rocks of uncertain age

LATE TRIASSIC

- TNw: Nicola Group: volcanic & sedimentary rocks

- Fault from photo-geological interpretation
- H-48: Rock outcrop
- *: “Outcrop” of unconsolidated or weakly indurated material
- S-8: Stream-sediment sample
- TDM: Copper showing

FIGURE 4d
Chat Block
Rocks of the Chataway variety of the Highland Valley Phase of the Guichon Creek batholith underlie the western two-thirds of the Chat Block. Various subdivisions of the Highland Valley Phase in the eastern part of the Block have been proposed. Essentially, they constitute intermediate sub-varieties between the Guichon variety and the adjacent phases and are lumped as Guichon variety on the accompanying Property geological maps. I was unable to distinguish any features of the intrusive rocks on the air photos that would serve to identify individual units. Because of uncertainties regarding the identification of the various rock types that purportedly make up the Border Phase, it is not distinguished from the Guichon variety on the property geological maps (Figures 4a, 4b and 4c).

Volcanic rocks of the Late Triassic Nicola group are indicated on government geological maps to be present in the eastern part of the Chat Block. My field mapping suggests that the area shown as volcanic rocks is underlain by mafic to intermediate intrusive rocks. These intrusions are described later in the report since most of their outcrop area lies within and adjacent to the Mamit Block.

Gently dipping intermediate to mafic volcanic rocks of the Kamloops group of Eocene age crop out east of Gypsum Lake. These are shown on all of the published maps. However, the outline of the unit shown on Figure 4a was interpreted from air photographs.

A late Tertiary(?) sedimentary unit (UTs) that surrounds Chataway Lake was first identified on air photos and later substantiated by field mapping (Bergey, 2007a). The unit consists of a thin basal conglomerate composed of crudely sorted, rounded boulders of granodiorite overlain by quartz-rich sandstone and grit. The rock is weakly indurated; in surface exposures -- the boulders in the conglomerate lack cementing material and the sandstone is rather friable. This unit apparently was not identified in percussion or diamond drilling, although Dot Resources Ltd. reported that several of the drill holes on their property southeast of the Chat Block encountered granitic boulders at the base of the overburden. All of the sandstone “outcrops” of this unit that I examined were exposed by digging through till with a mattock. Intrusive bedrock that I noted at several localities immediately underlying the “conglomerate” was highly fractured and weathered.
Unit UTs crops out in a number of remnants of what was once a much more extensive sedimentary deposit at an elevation of about 1500 metres in the western part of Chat Block. Similar weakly indurated sedimentary rocks are found in fault blocks within the Mamit Lake graben. The lithology and nearly horizontal dip of the sediments appear to be the same in the two areas but they cannot be correlated with certainty. A more complete description of the sedimentary unit and the related faulting in the graben is covered in the section on the Mamit Block.

The particular relevance of the late Tertiary (?) deposits near Chataway Lake to mineral exploration is that geochemical soil sampling is not meaningful in areas largely covered by these sediments, even though the unit may be very thin. In addition, their distribution confirms that the intrusive rocks on the plateau surrounding Chataway Lake were not exposed to erosion during a long time period. The significance is expanded upon later in the present report.

The faults shown within the Chat Block were interpreted from photogeology in the absence of any dependable information on fault distribution in the literature. The dominant trend of the regional faults is north to north-northwest. (These will be referred to as “the north-south regional faults” for brevity.) They include the named faults that appear to be associated with the major ore deposits, but not the faults within the Mamit Lake graben. Members of the north-south fault system seldom are linear in plan for long distances, except for the Lornex fault which is exceptionally straight.

The age relationships of the various faults are unclear, in part because some of the faults may have a long and complex history. In general, the north-south regional faults are older than the late Tertiary (?) sediments and are offset by all of the other interpreted faults. However, both the Lornex fault and another major north-trending fault located in the eastern part of the Chat Block, the “Western Graben-fault” (WG fault), clearly offset early Tertiary rocks. (The latter appears to define the western boundary of the “Mamit Lake” graben.) In both cases I believe that the latest movement represented the reactivation of precursor north-south regional faulting.
Mamit Block
The Mamit Block (Figures 5b and 5c) is a narrow claim group that follows along and east of the valley of Guichon Creek -- and the eastern margin of the Guichon Creek batholith -- for a north-south distance of 18 kilometres. The valley itself is almost entirely occupied by Tertiary clastic sedimentary rocks and by late-glacial sand and gravel deposits. Very little exploration work has been carried within a strip up to 2 kilometres in width, and the geology of the “basement” rocks cannot be deduced by photo-geology along this belt.

A major structural zone is inferred to underlie the valley on the basis of striking geological dissimilarities east and west of the valley. The aeromagnetic pattern north of Mamit Lake also is suggestive of a major discontinuity. The only surface manifestation of an early regional structure along the valley is the Mamit Lake graben, a Tertiary structural feature that comprises a number of predominantly north-south–trending normal faults whose dislocation appears to be relatively modest.

West of the Guichon Creek valley, rocks of the Guichon Creek batholith are exposed only in the northern portion of the Mamit Block. These include granodiorite and quartz diorite of the Highland Valley and Border phases. In the northernmost part of the Mamit Block, west of Guichon Creek, rocks of the Gump Lake stock are exposed along the western margin of the graben.

The Gump Lake stock is separated from the main mass of the batholith by faulting and, locally, by a “screen” of metamorphosed sedimentary and intrusive rocks of undetermined age. These rocks are correlated with the Nicola Group by McMillan (1978), and by Nethery (1978). Ney (1959) describes the rocks as mainly quartzite grading into metamorphosed granitic rocks of unknown affiliation. My limited observations tend to agree with those of Ney since quartz sandstone is not common in Nicola Group rocks.

A large body of intermediate to mafic intrusive rocks was outlined west of Mamit Lake. It was described as “diorite complex” by Ney (1959) and as Nicola volcanic rock by McMillan (1978). It includes a pyroxene-rich gabbro that closely resembles certain rocks in the Alkalic Intrusive Complex that is very common within the Nicola volcanic belt (e.g., Bergey, 2004; Bergey, 2007a). On this basis, and on the air-photo indications of a cluster of clearly defined circular features along the northern margin of the gabbro, I have assigned this unit to the Alkalic Intrusive Complex, subject to further
study. These rocks appear to intrude the granitic rocks of the Guichon Creek batholith.

The preliminary air-photo interpretation of the area east of Guichon Creek valley suggested that the Alkalic Intrusive Complex -- including a large proportion of circular features that were interpreted as breccia pipes-- was the dominant lithology. Remnants of intruded volcanic and sedimentary rocks of the Nicola Group were distinguished by their recessive nature and by indications of north-south stratification. Subsequent field work tended to confirm the interpretation. In the area southeast of Mamit Lake most of the bedrock that I examined was intrusive breccia composed of a heterolithic mixture of variably altered clasts of intermediate composition. No clasts of volcanic or sedimentary rocks were identified. Unbrecciated diorite occurs in parts of the area. This assemblage closely resembles the one mapped in the Greenstone Mountain area west of Kamloops (Bergey, 2007a) that I have designated the “Greenstone Mountain assemblage.” The photograph below illustrates the rounded domes that are characteristic topographic features of the Alkalic Intrusive Complexes in both areas.
A steeply southeast-plunging contact between a breccia pipe and limestone of the Nicola group is exposed in an outcrop about 100 metres in length southeast of Nicola Lake. Andesitic lava of the Nicola Group crops out a short distance east of the breccia contact. (See photographs below.)
A distinctive alkalic intrusive assemblage was mapped north of the fault that follows Rey Creek east of the south end of Mamit Lake. These rocks resemble the ones in the Aspen Grove alkalic complex and in the Beaton Lake assemblage of the Kamloops alkalic intrusive complex (Bergey, 2004; Bergey, 2007a). Monzonite, syenite and monzodiorite are the commonest constituents of the breccias in the latter cases. However, the main link with the “Mamit Lake assemblage” is a somewhat enigmatic rock that I termed “Brick-red Basalt” (BRB) at Aspen Grove. This is a porphyritic subvolcanic(?) intrusive rock that varies in colour from pale red to reddish purple. Numerous samples were analysed by Preto (1979); they were classified as “trachybasalt, potassic alkali series.” Amygdaloidal varieties occur, but they are very rare. BRB is found in the intrusive breccias as both fragments and groundmass. Only two large bodies of unbrecciated BRB have been mapped by the author – at Missezula Lake, and in the southwestern part of the city of Kamloops. A review of the literature indicates that BRB is always mapped as Nicola Group lava.

The “Mamit Lake assemblage” is poorly exposed in the areas that I visited and most of the information on it came from local float. I have insufficient data to differentiate it on the geological maps from the alkalic intrusive assemblage south of the Rey Creek fault. It appears to be composed of a much higher proportion of BRB than the similar assemblages in the Kamloops and Aspen Grove areas. Breccia with texture similar to that
illustrated in the photo above is present locally in both of these areas, usually mapped as Nicola “lahar” or “conglomerate.”

The gabbro that crops out west of the Mamit Lake graben shows similarities to the BRB. Under the binocular microscope the rock appears to be a “crowded” pyroxene-feldspar porphyry with a very minor amount of reddish groundmass. I believe that it may be a deeper-seated version of the sub-volcanic intrusions that constitute the BRB.

Granitic intrusive rocks related to the Jesse Creek stock crop out in the extreme southern part of the Mamit Block east of the Guichon Creek valley. These rocks appear to be similar in composition to typical rocks of the Guichon Creek batholith which lies immediately to the west beyond the Mamit Lake graben. Rock exposures are uncommon.

Two previously unidentified clastic sedimentary units of Tertiary age are confined mainly to the Mamit Lake graben except for remnants of unit UTs on the plateau surrounding Chataway Lake. The older unit (Tu) was noted only in the northern part of the Block where it flanks the crystalline highland west of the Guichon Creek valley. A third Tertiary sedimentary unit is not shown since it crops out only at the bottom of a small gorge a short distance north of the Property. This exposure is composed of thin-bedded siltstone and argillite that dips east at about 10 degrees. A percussion drill hole in the centre of the graben to the west was reported to have intersected similar material from 70 to 270 metres, where the hole bottomed. It was assigned by (Nethery, 1979) to the Coldwater Formation (Princeton Group). The material in the upper 70 metres of the hole was not logged.

Unit Tu is a deeply weathered sandstone, grit and pebble conglomerate with no readily discernable bedding. It disconformably overlies rocks that are tentatively assigned to the Coldwater Formation in the gully, at a contact dip of 20 degrees east. Its relationship to unit UTs is uncertain. However, rocks of the latter unit are more weakly indurated.

Flat-lying, weakly lithified sandstone and conglomerate (Unit UTs) that follows the axis of the graben and is exposed in fault blocks appears to correlate with similar rocks on the plateau surrounding Chataway Lake. The unit appear to have been down-dropped about 500 metres into the graben in several stages.
The Mamit Lake graben is the most obvious structural feature in the region. It also appears to be the youngest, although it is apparent that some of the faults were the results of the reactivation of major precursors. This appears to be the case for the WG fault.

**Tap Block**
This block, the most southerly part of the Property, is located only about four kilometres north of the Craigmont Mine. Outcrops of the Guichon Phase of the batholith are abundant in the western part of the Block. In the central portion, nearly four kilometres in width, is almost completely masked by younger sedimentary rocks and by transported glacial deposits. Local rock exposures within this area are composed predominantly of quartz diorite of the Border Phase.

The Jesse Creek stock is exposed in sparsely distributed outcrops east of the Mamit Lake graben. Quartz monzonite appears to predominate, on the basis of limited evidence. The relationship of the stock to the Guichon Creek batholith has not been established.

A number of north-south faults of the cluster that appears to be associated with the major copper deposits of the Highland Valley have been interpreted north of the Block and projected into the covered area (Figure 4c). The Tyner Creek fault, a major east-west structure, extends from the northwest corner to the southeast corner of the Tap Block.

**Unconsolidated Deposits**
Late-glacial ice-contact deposits, mainly eskers, kames and kame terraces, comprise the thickest overburden in the map area. Their identification and delineation are of particular interest because the presence of deposits of this type precludes the application of conventional geochemical techniques. These unconsolidated deposits are prone to landsliding on the steep slopes bordering Guichon and Skuhun Creeks. The cover of transported material is particularly deep along Chataway Creek south of the lake – several drill holes failed to reach bedrock at depths of greater than 100 metres. Similar material is present in the broad valley within the Skuhun Block. Elsewhere, transported overburden appears to be relatively thin, but is nearly continuous in the central part of the Tap Block and the southern part of the Mamit Block.
Glacial till forms a relatively thin blanket that covers the entire area except for the ice-contact deposits and the scarce, mainly small, rock outcrops. The distribution of till is not indicated on the geological maps since it does not inhibit the application of photo-geological interpretation. Till is a relatively effective medium for the application of conventional geochemical prospecting methods.

**REGIONAL MINERALIZATION MODEL**

The mines of the Highland Valley copper district, which lie between 8 and 14 kilometres northeast of the Chat Group, are obvious target models. These are the largest producers of copper in Canada, and they generate a substantial tonnage of molybdenum as well. The Highland Valley mines are classified as porphyry copper- and copper-molybdenum deposits of the calc-alkaline type. They are based on very large orebodies (150 million- to more than one billion-tonnes) that are spatially associated with regional faults, but that are not obviously aligned along faults except for the un-mined JA deposit, which is elongated parallel to the Highland Valley fault zone. Almost all of the mineralization occurs along fractures -- and fracture density is the most important factor influencing ore grade (Casselman et al. (1995). North-south and east-west fracturing appears to be dominant (Highland Valley Copper mine staff, pers. comm.) The copper minerals are bornite and chalcopyrite. Pyrite is present, but it is not abundant in the ore. The average ore grade depends to some extent on copper price but generally falls within the range of 0.40 to 0.45%.

The total sulphide content of an orebody may be less than 2%. The mineralized zones are not enriched in magnetite. Consequently, geophysical techniques other than induced polarization (IP) are ineffective, and even the IP response over a major deposit may be fairly weak, particularly if molybdenum is a co-product. This problem is exacerbated on the plateau surrounding Chataway Lake, where deep oxidation beneath an ancient land surface reduced the metallic- mineral content of the near-surface rocks.

The major copper deposits of the Highland Valley area are found mainly within the Bethsaida and Bethlehem phases of the Guichon Creek batholith. However, ore-grade mineralization extends into the adjacent, somewhat older, intrusive rocks, particularly in association with high-level dikes and intrusive breccia. This is not to say that the remainder of the batholith lacks widespread indications of copper mineralization. “Vein-type” deposits have
been explored and mined on a very small scale for more than a century within an area southeast of the property. (These are more properly referred to as shear-related deposits) They almost always appear to be found along or adjacent to north- to north-northwest-trending regional faults. The earliest mining in the region, albeit on a very small scale, was carried out on vein-type deposits within a belt that extended southeast from the central part of the Chat Block. A copper resource has recently been announced by Dot Resources on a stockwork deposit of the Highland Valley type near the south-eastern terminus of this belt close to the Guichon Creek Valley.

The orebody at the Craigmont Mine is classified as skarn type. It was deposited in volcanic and sedimentary rocks of the Nicola Group, limestone in particular, adjacent to intrusive rocks of the Border Phase at the southern margin of the batholith. The key element in the precipitation of copper minerals in this case appears to have been the “reactive” nature of the host rocks rather than the fracture density. The orebody contained some very high-grade mineralization where limestone was replaced by chalcopyrite – a characteristic of skarn-type copper deposits.

The photo-geological interpretation outlined a number of very continuous faults within the Guichon Creek batholith that I have termed “north-south regional faults.” An astonishingly large proportion of the known mineral occurrences in the region, including all of the major mines and the smaller Alwin, Krain, South Seas, Yubet and Dot deposits, appear to be spatially associated with these structures.

The copper values in the stream sediment within the Guichon Creek batholith are far higher than can be accounted for by known mineralization. Recent test work indicates that it is very unlikely that this is the result of concentration in the sampling process or of seepages of dissolved metal along the drainages. The less resistant zones of faulting were preferentially occupied by the creek valleys from which the stream sediments were collected. It is proposed that the anomalously high values reflect copper deposition along the regional north-south faults. This proposal is supported by regional stream-sediment sampling carried out by the B.C. Geological Survey that demonstrates a coherent pattern of copper values throughout the southern portion of the Guichon Creek batholith, implying that the faults act as a “plumbing system” for copper-rich hydrothermal solutions.
The stream-sediment anomaly pattern suggests that the mineralized faults extend at least as far south as the Craigmont mine at the margin of the batholith, where fractured volcanic rocks and limestone may have provided a favourable environment for high-grade ore deposition from hydrothermal solutions that utilized the regional north-south faults as conduits. [Berger (2007a) contains a discussion of the background to the development of this concept.
Widespread intense fracturing adjacent to the regional faults prior to the mineralizing events could have come about in various ways. Regional east-west faults are indicated in the vicinity of the Valley, Lornex, Highmont and JA orebodies. Breccia pipes and high-level dike concentrations are present in the vicinity of the deposits to the north – Bethlehem, South Seas and Krain.

In much of the region large zones of stockwork fracturing (as in the core of the batholith) or favourable host rocks (as at Craigmont) may not be present. However, multiple linear zones of shearing adjacent to north-south faults and dikes have provided conditions for the deposition of relatively high-grade copper mineralization at several sites. Under suitable conditions, wider zones of mineralization of this type might contain economically significant concentrations of high-grade mineralization adjacent to the regional faults.

DISCUSSION OF THE RESULTS OF THE WORK

The objectives of the geological work described in the present report were:

1) To produce a revised geological map of the easternmost portion of the Highland Valley Property. [This area includes the eastern portion of the Guichon Creek batholith, along with the Guichon Creek valley and its environs to the east.]

2) To re-interpret the pattern of regional faulting affecting the Guichon Creek batholith within the region surrounding the Highland Valley Property.

3) To select areas of particular interest for copper deposits of the types previously identified in the region, based on the geological work and literature research carried out over the past three years.

The geology of the eastern margin of the Guichon Creek batholith is complex. The published maps, except for Ney (1959), indicate a transition from granodiorite to quartz diorite and diorite within a border zone at the contact with volcanic rocks of the Nicola Group. I was unable to find any evidence of Nicola rocks west of Guichon Creek. I believe that the volcanic rocks indicated in the literature, and part of the Border Facies as well, are intrusive rocks related to an Alkaline Intrusive Complex that is a major component of the “Nicola Belt.” The Gump Lake stock appears to be separated from the batholith by a thin “screen” of quartzite and foliated granitic rock of uncertain affiliation. Elsewhere, the eastern contact of the batholith is not exposed.
Within the Guichon Creek valley, the “basement” rocks are masked by Tertiary sedimentary rocks and by late-glacial sand and gravel deposits. The north-south Mamit Lake graben extends across the entire map area but has not been traced beyond it for more than a few kilometres in either direction. [It is really more of a “half graben” since it appears to have been down-dropped about 500 metres in the west and as little as 50 metres in the east.]

The Jesse Creek stock, the only large body of granitic rocks east of the graben that are similar to the ones in the Guichon Creek batholith, is located in the southern portion of the map area. Elsewhere east of Guichon Creek valley, rocks of the Alkaline Intrusive Complex are dominant, along with minor remnants of Nicola volcanic and sedimentary rocks. Intrusive breccia is the main component of the Complex in the area. There appear to be two intrusive assemblages that are separated by the Rey Lake fault that extends east from near the south end of Mamit Lake. These are not shown separately on the geological maps because of insufficient field data.

The photo-geological study provided information that had not been available previously on Tertiary sedimentary rocks and transported glacial deposits. These data are useful in interpreting the results of earlier geochemical and geophysical exploration and in selecting appropriate survey techniques for ongoing exploration.

A proposed model for ore deposition in the Guichon Creek batholith suggests that a regional system of north-trending faults acted as a “plumbing system” that distributed copper in hydrothermal solution from an unknown source or sources. Precipitation of the metal was facilitated by intense fracturing of the more brittle rocks. The brecciation was localized along the north-trending faults by cross faults or, in a few localities, by breccia pipes and concentrations of high-level dikes. In the case of the Craigmont mine, the only major deposit outside of the batholith, limestone rather than brecciation acted as the main precipitant for copper.

The detailed photo-geological re-interpretation provides better definition of the pattern of the regional north-south and east-west faults that appear to have had a major influence on the localization of copper mineralization in the region.
I have concluded that the most favourable areas for future exploration based on the recent geological program are:

1. **The zone along the margin of the younger rocks that form the core of the Guichon batholith.** This zone is covered by deep overburden in part of the Skuhun Block and in the western part of the Chat Block.

   1a. The **Chataway Creek area in the western part of the Chat Block.** Several regional faults appear to extend into the area. The highest stream sediment values in our test are located in this area. The area has not been tested due to deep overburden.

   1b. The **Skuhun Creek area in the northern part of the Skuhun Block.** The interpreted HVC, Highmont and Roscoe Lake regional faults appear to converge and to intersect the Skuhun Creek fault near the northeast corner of the Skuhun claim block. There are high stream sediment values in the vicinity.

2. **The west-central part of the Tap Block.** This area is almost entirely covered by thin late-glacial deposits. Several north-south regional faults are present. Copper showings were drilled to the east along the east-west Tyner Creek fault, which transects the area. Sparse drilling within the general area intersected significant amounts of copper locally.

3. **The north-western part of the Chat Block east of 1a.** There are several broad IP anomaly areas that appear to be related to regional north-south faulting. These anomalies are poorly resolved due to the large electrode separation used. Transported cover is thin but fairly extensive.

4. **The extension of the Southeast Belt lying north of Twilight Lake.** This area appears to be almost entirely covered by basal till. Conventional geochemical soil sampling would be an effective tool for further exploration.

5. **The “Chataway Zone” south of Chataway Lake.** Although a mineral resource of approximately half a million tonnes of 1.6% copper has been published, this target is hypothetical since the results of the drilling have not been verified. Nevertheless, the reported occurrence deserves to be followed up. The putative zone appears to be covered by relatively thin late Tertiary(?) sedimentary rocks. [This prospect was discussed in Bergey (2007b).]

6. **The eastern projection of the Dupuis Creek fault in the northern part of the Mamit Block.** The Dupuis Creek fault extends east from the vicinity of the JA deposit. The Fiddler prospect, a disseminated copper deposit in metamorphosed sedimentary rocks, is located close to the Dupuis Creek fault. Induced polarization and geochemical anomalies are present along the projection of the fault into an area of complex geology within the Property. No recent field work has been carried out.
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**Tap Group**


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Hindson, R.E., 1972, **A geochemical report on the Jua mineral claim:** Prepared for Exel Explorations Ltd., ARIS Report 3708


Mamit Group


Respectfully submitted,

W.R.Bergey, P.Eng.

July 22, 2009
APPENDIX

Descriptions of Rock Samples

M-1 [51758 E _ 95567 N] Quartz monzonite – hornblende phenos (1-2mm); magnetic

M-2 [50644 E _ 92700 N] Quartz diorite – medium grey; hornblende phenocrysts 2-4 mm; highly magnetic.

M-3 [49760 E _ 91550 N] Granodiorite -- hornblende 2-4 mm; magnetic.

M-4 [49900 E _ 91240 N] Quartz monzonite -- similar to M-1; magnetic.

M-5 [50722 E _ 89111 N] Quartz monzonite -- similar to M-4.

M-6 [52775 N _ 87200 E] Sandstone – fine-grained, mainly quartz.

M-7 [52750 E _ 87310 N] Quartzite --fine-grained, limonitic.

M-8 [52700 E _ 87225 N] Metamorphosed sandstone _ quartz rich; mafics concentrated along parallel 0.5-1mm bands; quartz diorite stringers; disseminated pyrite and chalcopyrite; not magnetic.

M-9 [same locality] Foliated quartz diorite – abundant aligned hornblende crystals; magnetic.

M-10 [same locality] Metamorphosed sedimentary rock (?) – very fine-grained quartz-rich matrix, larger feldspar crystals; limonite along fractures; non-magnetic.

M-11 [57640 E _ 74920 N] Intrusive breccia – mainly pale-brown, plagioclase-rich diorite clasts (1-2 cm); sparse matrix; non-magnetic.

M-12 [57870 E _ 74855 N] “BRB” (see Report for explanation) – very fine-grained, reddish grey holocrystalline matrix; abundant plagioclase phenocrysts (0.5-1.5 mm); highly magnetic.
M-13 [58446 E _ 75566 N] “BRB” -- dark purplish matrix; fairly sparse plagioclase phenocrysts, mainly > 2 mm; scattered pyroxene (<1 mm); highly magnetic.

M-14 [58536 E _ 75640 N] Intrusive breccia (?) – fine-textured, clasts somewhat indistinct; pale green to grey-brown diorite; non-magnetic.

M-15 [58610 E _ 75725 N] Intrusive breccia – heterolithic, mainly monzonite & monzodiorite, some BRB; clasts mostly < 2 cm; magnetic.

M-16 [same locality] Intrusive breccia – similar; largest fragments have plagioclase and pyroxene phenocrysts in pale-green matrix (i.e., are similar to BRB but are not red); weakly magnetic.

M-17 [59723E _ 59000N] Intrusive breccia – fragments <1 cm; epidotized; Some pinkish feldspar crystals (potassic alteration ?); non-magnetic.

M-18 [56965 E _ 76000 N] Intrusive breccia – clasts mainly 3-5mm; pale grey to pale green microdiorite predominant.

M-19 [57054 E _ 76005 N] Intrusive breccia – similar.

M-20 [57100 E _ 76165 N] Sandstone – coarse grained; non magnetic.

M-21 [same locality – fault contact with M-20] Intrusive breccia – fine textured (3-5mm), mainly green microdiorite + BRB; non-magnetic.

M-22 [56790 E _ 75505 N] Intrusive breccia – similar; non-magnetic.

M-23 [57300 E _ 76425 N] Intrusive breccia – similar, but more BRB clasts; highly magnetic.

M-24 [57450 E _ 76625 N] Intrusive breccia – composed entirely of green to reddish green plagioclase-phyric microdiorite; magnetic.

M-25 [57630 E _ 77065 N] Intrusive breccia – BRB clasts (very dark red) in green matrix; very magnetic.

M-26 [57603 E _ 77400 N] Intrusive breccia – similar; magnetic.
M-27 [58400 E _ 79000 N] **Intrusive breccia** – similar; magnetic.

M-28 [58770 E _ 79177 N] **Limestone** – non magnetic.

M-29 [58800 E _ 79395 N] **Andesitic lava** – abundant amygdules; fairly abundant plagioclase phenocrysts in very fine-grained green matrix; non-magnetic.

M-30 [59085 E _ 79350 N] **Andesitic lava** – pale green; sparse amygdules; non-magnetic.

M-31 [59326 E _ 815530 N] **BRB** – variably red and green; plagioclase phytic; magnetic.

M-32 [same large outcrop] **BRB** – red; plagioclase phytic; weakly magnetic.

M-33 [same large outcrop] **BRB** – very pale reddish-green matrix; plagioclase phenocrysts 2-3mm, pyroxene smaller; non-magnetic.

M-34 [59000 E _ 82485 N] **Intrusive breccia** – clast-supported heterolithic intrusive breccia (see P.28); clasts rounded to angular, 1 to 2 cm; mainly BRB, monzonite, monzodiorite.

M-35 [55098 E _ 80167 N] **Pyroxene gabbro** – fairly coarse textured, equigranular; highly magnetic (as are all samples of gabbro).

M-36 [55120 E _ 80565 N] **Pyroxene gabbro** – similar; reddish.

M-37 [55505 E _ 81352 N] **Pyroxene gabbro** – reddish, finer texture; resembles coarser, non porphyritic BRB.

M-38 [55020 E _ 81765 N] **Pyroxene gabbro** – similar.

M-39 [54777 E _ 82342 N] **Pyroxene gabbro** – coarse textured; has fragmental appearance.

M-40 [55450 E _ 580500 N] **Pyroxene gabbro** – finer texture; reddish purple; pyroxene and lathe-shaped plagioclase phenocrysts.
M-42 [56555 E _ 69250 N] Quartz monzonite – abundant hornblende phenocrysts; magnetic.

M-43 [55000 E _ 70700 N] Quartz monzonite – similar, but hornblende phenocrysts less abundant; non-magnetic.

M-44 [55900 E _ 87800 N] Grit – relatively weakly lithified (as are rock samples M-45 to M 47; large clasts mainly porphyritic microdiorite; magnetic.

M-45 [56015 E _ 87526 N] Grit – similar; magnetic.

M-46 [56170 E _ 87120 N] Grit – similar; reddish matrix; magnetic.

M-47 [56144 E _ 87786 N] Pebble conglomerate – some BRB clasts; weakly magnetic.

M-48 [56011 E _ 87816 N] Sandstone & siltstone – laminated; non-magnetic (underlies weakly lithified conglomerate and grit).

M-49 [56050 E _ 84780 N] BRB – very fine textured matrix, pyroxene & plagioclase phenocrysts; magnetic.

M-50 [56000 E _ 87840 N] Grit – weakly lithified; mainly microdiorite, some BRB clasts, magnetic.
## STATEMENT OF COSTS

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48
STATEMENT OF QUALIFICATIONS

I, William Richard Bergey of 25789 - 8th Ave., Aldergrove, B.C., do hereby certify that:

1. I am a Professional Engineer (Geological) in the Province of British Columbia.

2. I have been employed in mining and mineral exploration for the past 62 years.

3. I have had many years of experience in geological mapping and photo-geological interpretation related to mineral exploration.

4. I personally conducted all of the geological work described in the above report.

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