DEEP-PROBE INDUCED-POLARIZATION SURVEY REPORT

on the

ASHTON GROUP MINERAL CLAIMS

NTS 92I/6W & 92I/3W
KAMLOOPS MINING DIVISION

LATITUDE:	**50°14'52" NORTH**
LONGITUDE:	**121°23'45" WEST**
OWNERS:	**J.M. ASHTON** **S.E. APCHKRUM**
OPERATORS:	**J.M. ASHTON** **J.M. ASHTON & ASSOCIATES LTD.** **808 EXPLORATION SERVICES LTD.** **S.E. APCHKRUM**
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SUBMITTED:	**31 August, 1999**

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DEEP-PROBE INDUCED POLARIZATION SURVEY REPORT

SECTION 1.0 — INTRODUCTION

The Ashton Copper Prospect, located about 12 miles due east of the Village of Lytton, British Columbia, has seen recorded mineral exploration over the area of interest since the discovery of a large, strong, copper-in-soils anomaly in 1969. The anomalous area was re-discovered as a result of a new multi-element soil survey conducted in 1993.

Staged exploration progress has been made on the prospect since 1990. However it was not until a 7-hole percussion drilling program was completed in 1993 followed by a methodical geological analyses of the cuttings and complementary petrographical study of carefully selected representative rock chip specimens that mineral resource potential was recognized.

The geological work concluded that the large area of interest was pervasively altered and mineralized and contained at least three types of episodically mineralized intrusives; quartz-diorite, diorite and gabbro. Mineralization within these structures occurs as disseminations and veins believed to be deposited along northerly trending structures noted in the area. Widespread alteration in the form of calcite flooding and quartz-carbonate, pyrite-chalcopyrite veining was noted in all of the holes drilled in the area of interest. These structures may play host to economic copper mineralization at depth.

Significant skarnification and marblization is found proximal to the intrusive structures, in drill holes and at surface, within the contact aureole with a meta-sedimentary and meta-volcanic sequence. According to Meinert (1995) "Skarn mineralogy is mappable in the field and serves as the broader 'alteration envelope' around potential orebodies." Copper-rich massive sulphide deposits can be found within such an environment.

Petrographical work supported the conclusions of the geological work and concluded in addition that plutonic zones of tonalite (quartz-diorite) through to diorite and to gabbro that underlie the area of interest also include their altered equivalents of pyroxene gabbro, pyroxenite, hornblende-diorite and horneblendite. Significant fluid-controlled metasomatic skarn alteration was also identified in three of the drill holes as a result of the petrographical study.

The best copper mineralization was found to be spatially related to the altered pyroxene-gabbro and pyroxenite units.

Therefore the area of interest could play host to two types of mineral resources; a porphyry or intrusive hosted low-grade? copper deposit at depth; or a skarn-related contact metasomatic copper-rich massive sulphide type deposit within the contact zone between the altered intrusive complex and the intercalated meta-sediments and meta-volcanics. An Upper Triassic/Lower Jurassic sedimentary-volcanic pile underlies a late Cretaceous volcanic unit on the east side of the property and possibly surrounds the intrusive complex on its north, and south sides as well. The Mount Lytton Complex appears to be proximal to the intrusive complex contact zone on the west side.

The geological logging results from vertical drill hole RC93-3 was of particular interest because the bottom interval between 430 feet and 500 feet total depth was found to contain a mineralized stockworks zone consisting of quartz-carbonate, pyrite-chalcopyrite veins. However no induced polarization chargeability or resistivity correlations from the 1993 IP survey could be made to this interval because the survey had a penetration limitation to an estimated 140 metres (460 feet) total depth which in this case was marginally at the top of the stockworks zone. It is speculated that this zone could be the roof zone of a mineralized intrusive system.

The area around drill hole RC93-5 was also of particular exploration interest because surface outcrop and old trenches nearby contain skarn-related copper mineralization and 50 metres to the east of the drill-hole collar is the west edge of a highly anomalous copper-in-soils anomaly with a south-north strike length of at least 1,100 metres (3,600 feet) and up to 300 metres (980 feet) in width.

Accordingly a full review of all data collected to date was undertaken and it appeared that a two-line **deep-probe induced polarization survey** would be a cost effective exploration procedure and might provide useful new data in assessing the mineral resource potential believed to be located at depth both within the intrusive complex and within the contact aureole with the meta-sediments and meta-volcanics.

To cover the two target types a two-line deep-probe induced polarization survey was designed during a property visit on the 4th of May 1999, in advance of the actual survey because some organization of geophysical equipment was required to enable the deep-probe test. An "a" spacing of 100 metres (328 feet) was chosen and the survey would include 6 separation levels.

With this configuration the nominal depth of penetration was expected to be about 420 metres or approximately 1,400 feet and would provide an ideal pseudosectional view of the electrical characteristics of each subcropping section and exceed the 1993 survey penetration-depth by about 300 metres or 1,000 feet.

As a caveat, it is emphasized that in conducting an induced polarization survey to measure the apparent-chargeability and apparent-resistivity effects, nominal depths of penetration are mentioned because the actual depth of penetration depends upon the relationship of both the geometry and electrical properties of the subcropping lithology. Therefore the electrical features shown in pseudosection can vary in dimension to that shown as can the depth of penetration be more or less than displayed. However the pseudosections can provide a very good guide as to the shape and size of the electrical features determined by the induced polarization survey technique.

Line 100-South (100S) was planned to cross: all of the known zone of skarnification in outcrop along the east contact zone; and drill holes: RC93-3, RC93-1 and RC93-2 consecutively in succession, which were drilled into the intrusive complex. This survey line would track in a straight line in an east to west direction. It would also cross close to the widest part of the large copper-in-soils anomaly, a distance of 900± metres (3,000 feet), and the east contact zone of the intrusive complex.

Line 100-West (100W) was planned to cross drill holes RC93-1 and RC93-2 from a south to north direction in order that the two-line survey would intersect and tie with Line 100-S. The survey line would also cross both the south and north contact zones of the intrusive complex and include what appeared to be skarn development found in drill hole RC93-1 near what is believed to be the north contact zone.

The two orthogonal lines would provide a deep 3-dimensional display of the electrical characteristics of the central section of the altered intrusive complex and intrusive contact-aureole on three sides. Hopefully the results would answer some outstanding questions, particularly the reasons for the strong copper-in-soils geochemistry at the locations plotted, and further assist in formulating the next stage of exploration.

The Kamloops office of the Ministry of Energy and Mines, Energy and Minerals Division, were contacted in advance of the work, and **Work Permit KAM 99-0300372-1102** was granted to allow the deep-probe induced polarization survey to proceed.

SECTION 2.0 — SUMMARY & RECOMMENDATIONS

2.1 General

A deep-probe, 6-level, induced polarization survey using an "a" spacing of 100 metres (328 feet) was completed on the Ashton Copper Property on the 29th and 30th days of June, 1999. The survey was designed to test a large altered intrusive structure and its contact aureole to the east, south and north to a depth of 420 metres (about 1,400 feet) along the two sections surveyed.

Taking into account the caveat on the potential variabilities of anomalous sizes and shapes and depths of penetration explained in the introduction, measurements of apparent-chargeability in millivolt-seconds/volt and apparent-resistivity in ohm-metres were made and plotted along two pseudosections that each represent a sectional view of the electrical characteristics along a nominal section 2,200 metres (7,216 feet) in length by 420 metres (1,400 feet) in depth. The two deep-probe survey lines are plotted as Line 100S, which cuts the targetted structures almost east to west and the other, Line 100W cuts the targetted structures in a south to north direction.

Total distance surveyed was 4.4 km. Useful electrical data collected during the survey also included self-potential gradient measurements, in millivolts, which were recorded from each potential electrode pair.

The interpretations of the survey results may have economic significance and are sufficiently encouraging as to justify additional exploration. The two distinct anomaly types identified could each potentially represent economic copper resources.

Induced polarization **Primary IP Anomaly I** is represented by a large volume of high chargeability which correlates to an integral very-high resistivity and coincides with a strong copper-in-soils geochemical anomaly. This anomaly could represent a large tonnage, low-grade, disseminated, and vein type copper resource at depth.

Induced polarization **Primary Resistivity Anomaly II** is a zone of extremely-low resistivity with an average calculated conductivity-thickness of 12.2 mhos and could represent a copper-rich contact metasomatic massive-sulphide deposit within the skarn alteration envelope.

Induced polarization **Resistivity Anomaly III** is a zone of very-low resistivity with an average calculated conductivity-thickness of 2.8 mhos and could represent a copper-rich contact

metasomatic massive-sulphide deposit within the skarn alteration envelope.

Induced polarization **IP Anomaly IV** which is a relatively weak feature at an "a" spacing of 100 metres could represent a stronger yet much narrower zone of chargeability that could be of interest.

2.2 Zone of High Chargeability, Primary IP Anomaly I

A large chargeability anomaly with an integral high to very-high resistivity zone was identified by the survey. It is identified as Primary IP Anomaly I on the pseudosections. Its south-north axis is defined by Line 100W and its east-west axis is partially defined by Line 100S. The anomaly is open to depth and to the west.

With the very large volume of rock sampled this survey appears to have defined the chargeability structure much better than the depth-limited 1993 survey because the larger "a" spacing provides a means to average or smooth the data better providing better contrast; particularly when the interest is a large target. The topographical component of this survey provides an additional variable to add to the uniques program which produces the pseudosections and provides a more accurate picture of the subcropping electrical geometry as would otherwise be the case. This depth-probe has provided good definition of the electrical properties and respective geometries of an extremely large volume of rock, to a great depth of penetration; defining what could be a significant mineralizing event.

See **Figures 4 through 7** for pseudosection presentation of the IP data. As shown on Line 100W Primary IP Anomaly I appears to plunge towards the north.

It is apparent that of the five reverse circulation drill holes that were drilled into the intrusive complex in 1993 none of them penetrated the primary target of high-chargeability and integral high resistivity of Primary IP Anomaly I as defined in this 1999 deep-probe survey. Had the 1993 drilling focused on the coincidental IP anomaly and highly anomalous copper-in-soils anomaly the drilling might have tested the primary target zones identified by this 1999 survey.

In examining the chargeability data from this 1999 survey and comparing it with the 1993 survey data it was possible, on Line 100S, to correlate the 4th level 1993 IP chargeability values at 200 metres (nominally 140 metres plot section) below surface, with the 2nd level 1999 IP chargeability values, at 200 metres (also nominally 140 metres plot section).

The comparison showed that the 1993 chargeability values along the convergent section sampled are higher than the 1999 survey values by a factor of 1.5 with very good positive correspondence. Hence the 1999- 11.0 millisecond maximum chargeability measured at 250 metres (820 feet) total depth on Line 100W appears to represent a chargeability of 16.5 milliseconds normalized to the 1993 survey results. Hence it can be forecast, that in terms of probabilities, a significant increase in chargeability with depth in Primary IP Anomaly I should be found.

Within chargeability Anomaly I, a high to very-high resistivity core, possibly caused by increased silicification, is coincident with the highest zone of chargeability and conformably plunges to depth towards the north. It also appears to be open to depth.

Silicification played a prominent role in the large Valley Copper deposit, Osatenko (1976); where the 10 percent secondary quartz content defined the bornite/chalcopyrite orebody in association with high chargeability. Bornite is the most abundant copper mineral in the Valley Copper deposit with the bornite/chalcopyrite ratio being the highest in the central silicified section of the deposit.

The large volume of high chargeability of Anomaly I can in all probability be attributed to disseminated sulphides with a small contribution from fine grained disseminated magnetite. However if copper-sulphides are present the amount of copper may or may not be related to the highest chargeability; it could be a zoned feature to the sulphide concentration or it could be coincidental with it; only drilling will establish this.

However the apparent 4.5 millisecond chargeability increase with depth could be economically significant. Van Blaricom, p.81 and 90, showed that a chargeability contrast of only 3.5 milliseconds (ms) from a nominal 7.8 ms to 11.3 ms at the Lornex Highland Valley porphyry copper deposit meant the difference between non-ore grade and ore grade rock, respectively.

2.3 **Zone of High Conductivity-Thickness, Primary Resistivity Anomaly II**

This deep-probe survey discovered a unique zone of extremely-low resistivity that averages 8.2 ohm-metres and has a calculated average conductivity-thickness of 12.2 mhos that could be caused by massive sulphides. The conductivity-thickness is significant because each point measured on the pseudosection represents a large volume of rock sampled across a 100 metre

interval. Conductivity-thicknesses of between 1.0 and 300 mhos are considered to be excellent conductors and many world class massive sulphide deposits have conductivity strengths within this order of magnitude.

Primary Resistivity Anomaly II has a calculated minimum conductivity-thickness of 5.6 mhos and an average conductivity-thickness of 12.2 mhos. The top of this conductive structure appears to subcrop about 140 metres (460 feet) below surface on Line 100S at Station 1400W. It has an apparent down dip extension of more than 400 metres (1,300 feet) and is open to depth. It could be up to 100 metres thick, forming near the east wall of the heavily altered intrusive complex. It would appear to be within the skarn alteration envelope found at surface and in the drill holes near this location. It could be a massive sulphide deposit containing an economically significant copper resource having formed in the classic sense.

The following geochemical, geophysical and geological features provide added support to finding a skarn-related massive sulphide structure containing copper minerals at depth at this location:

1. A distinctly linear geochemical copper-in-soils anomaly with some of the highest copper values measured in the survey, up to 1,438 ppm copper, directly overlies the 12.2 mho subcropping conductor. The copper anomaly has a width of 250 metres (820 feet) at Line 4800N which is within 100 metres (330 feet) north of the subcropping 12.2 mho conductor at Line 100S, Station 1,400, shown on the pseudo-section. This linear copper anomaly with values greater than 400 ppm copper has a strike length of more than 1100 metres (3,600 feet) and is open to the north and south. It widens in an undulatory fashion to a maximum width of 300 metres (980 feet) at several locations on strike.

2. A VLF-EM survey, Ashton (1990) had its most southerly survey line on Line 5000N. Two VLF-EM anomalies caused by electromagnetic induction effects from an unknown subcropping conductor inducted by electromagnetic waves from VLF radio transmitters from Seattle and Hawaii, were coincidental and centered on Station 400E which is the strike extension of this high conductivity anomaly. One of these anomalies was the strongest VLF-EM anomaly of the survey with a maximum dip-angle of 113 degrees.

3. The very strong linear copper geochemical trend extends over both VLF-EM anomalies and high conductivity-thickness anomaly and in all probability links all three separate features.

4. The 1990 magnetometer survey did not indicate any significant magnetic response over this area which diminishes the probability that the identified conductor contains significant magnetite.

5. The conductor appears to be closely associated with the zone of skarnification and may in fact be positioned within the skarn "alteration envelope".

6. The conductor appears to be conformable to the easterly dipping lithology suggesting that it may have formed within a favourable limey-host horizon of the meta-sediments.

7. A two station negative millivolt Self-Potential anomaly overlies the identified conductor suggesting that the conductor could be massive sulphides undergoing chemical oxidation.

8. The conductivity anomaly apparently has formed along the east hanging wall of the large Chargeability Anomaly I associated with an intensely altered, multiple phase, intrusive complex. It is along such contact aureoles with favourable host lithology that contact metasomatic skarn deposits containing economic massive sulphides are classically found.

2.4 **Zone of High Conductivity-Thickness, Resistivity Anomaly III**

The deep-probe survey discovered a second zone with very-low resistivity averaging 35.3 ohm-metres that has an average calculated conductivity-thickness of 2.8 mhos that could also be caused by massive sulphides. The conductivity-thickness is significant because each point measured on the pseudosection represents a large volume of rock sampled across a 100 metre interval. A conductivity-thickness of 2.8 mhos is within the envelope of a good to excellent conductor and many world class massive sulphide deposits have conductor strengths of this order of magnitude.

The top of this conductive structure appears to subcrop about 230 metres (750 feet) below surface on Line 100W, Station 800N. It has an apparent down dip extension of about 200 metres (650 feet) and is open to depth. It could be up to 100 metres thick forming near the north hanging-wall of the altered intrusive complex.

Nearby vertical hole RC93-1 contained significant skarnification below 300 feet (100 metres) and so far is the only evidence of skarn development at this location. This anomaly could be a contact metasomatic type massive-sulphide deposit contained within the classic skarn envelope.

2.5 Zone of Medium Chargeability and High Resistivity; IP Anomaly IV

This moderate chargeability, coincident high resistivity anomaly identified as IP Anomaly IV does not outcrop on surface. There is no known copper geochemical anomaly above it, or where it is projected to outcrop, or in the general neighborhood.

The zone subcrops about 200 metres below the surface at Line 100W. Station 1,050. It has an apparent dip to the north-northeast of about 45° with a dip length of 300 metres. The chargeability portion of the anomaly may or may not be open to depth.

The top of this subcropping feature when projected vertically to surface intersects a large two-station (Hawaii & Seattle) VLF-EM anomaly, Ashton (1990), which strikes about 330° Azimuth for almost 500 metres.

Correlation with the two superimposed VLF-EM anomalies indicates the probable cause is disseminated sulphides. This IP anomaly represents an average chargeability over 100 metres of sample width hence it could be the combined effect of a much narrower high chargeability zone representing significant sulphides within a neighboring low-chargeability background, in which case its cause would be worth investigating.

However the cause of this anomaly should only be investigated following the next stage of drilling into the high priority targets, Primary IP Anomaly I and Primary Resistivity Anomaly II, if the results indicate the potential for economic success.

2.6 Recommendations

The following recommendations are made:

1. In advance of further drilling, detailed geological mapping of the property should be completed. R.E. Gale, Ph.D., P.Eng., in his 1994 report recommended that particular attention be paid to mapping the contact zone between the intrusive complex and the volcanic-sedimentary complex. The positive results of this deep-probe induced polarization survey now necessitates this work as a priority.

2. In advance of further drilling, expand the deep-probe induced polarization survey to include the entire intrusive complex area and its contact aureole. The survey should include at least 19 deep-probe lines, 100 metres apart between Lines 4,000N and 5,800N and extend from about 800E to 600W. The survey lines must be cut and carefully surveyed. The total IP survey distance should be not less than 30 km.

   The results of this survey will provide a three-dimensional pseudosection of the intrusive complex and contact aureole and could possibly re-define the drill targets recommended herewith to higher priority ones.

3. Additional drilling, as Gale (1994) also recommended, should be with a diamond drill in order that the complex geological relationships between the multiple-phased intrusive complex and the limestones, skarns, and other lithologies of the volcanic and sedimentary pile can be properly interpreted.

4. Diamond drilling of extremely-low resistivity, Primary Resistivity Anomaly II, has the highest priority because it could represent a massive-sulphide type deposit containing medium to high grade copper minerals given that its low conductivity-thickness average value of a nominal 12.2 mhos over a large dimension in all probability represents an excellent conductor. It should be drilled from Station 1,150W on Line 100S at minus 45° for a total length of at least 500 metres (1,650 feet). This way Primary IP Anomaly II, the Contact Aureole Zone, and the high chargeability and corresponding high and very high resistivity zones of Primary IP Anomaly I can be drill tested simultaneously. Both of these geophysical targets correspond to the highest magnitude and largest surface area copper-in-soils geochemical responses on the property.

5. The area between Stations 1,650W and 1,950W on Line 100S should be trenched. The high chargeability corresponding to the high resistivity zone of Primary Anomaly I appears to come close to the surface along this section and could subcrop below the overburden.

   This area has no visible outcrop, nor has it been drilled or exposed by trenching. Overburden depth along this section could be 6 metres (20 feet), or more, as was found in drill hole RC93-3, drilled about 100 metres (300 feet) east of this zone.

6. The contact aureole at depth shows two other very low resistivity or excellent conductivity-thickness anomalies along the south contact aureole and north contact aureole. These high conductivity-thickness anomalies could also represent massive sulphides and should be tested; contingent upon the outcome of drilling Primary IP Anomaly II.

7. A recommendation for additional drilling should be held in abeyance depending on the outcome of the additional geological mapping, induced polarization survey and drilling recommended in this report.

SECTION 3.0 — LOCATION AND ACCESS

The Ashton Group of mineral claims is located approximately 19 km (11.8 miles) south of Spence's Bridge, British Columbia near the confluence of the Nicoamen River and Thompson's River where this river turns sharply west towards Lytton. Spence's Bridge is located approximately 109 km (118 miles) by air northwest of Vancouver, British Columbia, on Trans-Canada Highway 1.

The Canadian Pacific Railway parallels the Trans Canada Highway at this location.

Locally, the northwest corner of the claim group is located about 1,000 metres from the confluence of the Nicoamen River where it enters the Thompson River.

A good all-weather forest service road provides immediate and easy access to the central part of the claims southward from the paved Trans-Canada Highway near the confluence of the Nicoamen and Thompson Rivers. Several old logging roads with secondary tree growth cross the property and intersect with the main access road, thereby providing the potential for road access to most every sector of the property through a minimum of rehabilitation.

The rehabilitation of pre-existing logging roads by the removal of trees and brush carried out in 1993, to provide drill and truck access to the seven drill holes completed at that time, facilitated vehicle access to the main areas of geophysical interest for this program of geophysical induced polarization surveying.

SECTION 4.0 — PROPERTY AND OWNERSHIP

The Ashton Group is comprised of the following mineral claims with expiry dates as shown subject to acceptance of this report:

Mineral Claim	Units	Tenure No.	Expiry Date
Rebecca 2	15	369944	28 June 2004
Rebecca 3	20	369945	28 June 2004
Rachel 1	1	311562	17 July 2000
Rachel 2	1	311563	17 July 2000
Rachel 3	1	311564	17 July 2000
Rachel 4	1	311565	17 July 2000
Mellisa	8	318692	1 July 2001
Total	47		

The Rachel 1 to Rachel 4, inclusive, Mineral Claims, and the Mellisa Mineral Claim, are held by record in the name of J.M. Ashton, of Vancouver, British Columbia.

The Rebecca 2, and Rebecca 3, Mineral Claims are held by record in the name of Sylvia E. Apchkrum of White Rock, British Columbia.

SECTION 5.0 - EXPLORATION HISTORY

The first recorded work on the Ashton Prospect was directed by Alfred A. Burgoyne, M.Sc., in October 1969. His work included a single element copper in soils survey which resulted in the delineation of a large area of highly anomalous copper in soils.

Burgoyne's work was followed up by J.W. Antal, P.Geol. (Alberta) with a program of limited surface trenching, geological assessment and intrepretation. The trenching showed shear zone hosted copper mineralization in skarn within part of the large copper anomaly. There was no mention of local intrusive activity. Antal did conclude in his November 1969 report that the prospective area had the potential for hosting a large low-grade copper deposit at depth.

In 1989-90, the former Rebecca 1 to 6, inclusive, and Sheryl mineral claims were staked and following that a Magnetometer and VLF-EM survey was carried out over what was believed to be the area of interest under the direction of J.M. Ashton, P.Eng.

The magnetometer survey identified a prominent magnetic anomaly north of Line 5200N on the baseline with an amplitude response greater than 3,000 gammas (Nanoteslas) for a northerly strike length of 350 metres (1,050 feet). The location of this anomaly relative to the 1969 copper in soils anomalies was not known at the time, but it was suspected that there was a close relationship.

The VLF-EM survey located a number of electromagnetic conductors which had a charactersitic north-south strike. One of the more prominent electromagnetic conductors identified had its highest dip angle amplitude on Line 5000N at Station 400E where the south extension of the survey terminated. This anomaly continued with increasing attenuation for 400 metres (1,300 feet) to the north.

In 1990, a petrographical study by P. Reid, Ph.D., of GeoTex Consultants Limited, of a representative rock sample taken by J.M. Ashton within the area of the magnetic anomaly showed that the rock was "a heavily altered fine-grained pyroxene diorite ? with the alteration assemblage consisting of calcite, chlorite, epidote, sphene, pyrrhotite, and hematite. The original rock has been nearly obliterated by alteration facies. The tourmaline, a major part of the alteration assemblage, indicates that hydrothermal solutions causing the alteration contained significant volatiles."

In August 1992, R.E. Gale, Ph.D., P.Eng., examined the prospect and confirmed the skarnification reported by J.W. Antal, and also confirmed the altered an unaltered diorite reported by J.M. Ashton.

In April 1993, Kingston Resources Ltd. optioned the property from the recorded owner, S.E. Apchkrum, and in June 1993 carried out a geochemical sampling and limited mapping program to confirm the copper in soils anomalies identified by Burgoyne in 1969.

Kingston's geological mapping also confirmed that heavily altered diorite was associated with the copper-in-soils anomaly and the diorite contained significant disseminated magnetite.

A further expanded soil survey conducted by Kingston in June, 1993 showed a much larger area of anomalous copper than had been identified through their initial work. They concluded that the copper-in-soils anomaly was closed to the west, south and east. The copper anomaly may be open to the north but could represent downslope mechanical dispersion.

An induced polarization survey using the Pole-Dipole Array was conducted by Lloyd Geophysics Inc. in July 1993, using a Huntec Mark 2 Model 7500 Transmitter and an EDA Model IP-6 Receiver. A 50 metre electrode spacing was used with 4 levels surveyed. Maximum depth of penetration is estimated to be of the order of 140 metres (460 feet).

A significant chargeability anomaly of classic character was found to be co-incidental with the southwestern quadrant of the copper-in-soils anomaly and the altered diorite sporadically exposed at surface. This ellipsoidal anomaly using the 7.5 millisecond chargeability isogon covers about 320,000 square metres (80 acres). Its major axis strikes about 290° azimuth.

The Induced Polarization survey results were encouragement enough for Kingston Resources Ltd. to complete a 7-hole percussion drill program to test the anomalous chargeability features. However the assay results from the drilling were considered disappointing as only a very-low grade copper deposit averaging about 600 ppm copper was indicated from the holes drilled; with the consequence that they dropped their option in 1994.

In February, 1994, R.E. Gale, Ph.D., P.Eng., re-logged the drill cuttings from a suite of representative samples saved from the drilling. Part of Gale's report summary included the following:

" The limy diorite and skarn-marble and their contact areas appear to be the best host rocks for copper mineralization."

" It is apparent from the occurrence of at least 3 types of mineralized intrusives: diorite, gabbro and quartz diorite; that there are multiple intrusive phases present in the altered and mineralized system on the property. Mineralization occurs both as disseminated zones and as mineralized vein systems, probably along the predominant northerly trending structures noted in the area. Alteration in the form of calcite flooding and quartz and calcite veining was noted all of the southernmost holes, RC93-1 through RC93-5 and therefore is widespread in the area.

In January, 1995, at the recommendations of R.E. Gale, P.B. Read, Ph.D. completed a petrographical study of drill chips selected by Dr. Gale. Dr. Read's conclusions included but are not necessarily limited to the following:

" The thin-sectioned rock chips generally support Gale's 1994 logging of the reverse-circulation drill holes but carry the implication that the widespread intrusions include pyroxene gabbro, pyroxenite and horneblendite in addition to the horneblende diorite which Gale noted."

Dr. Read acknowledged the presence of the altered equivalents to all of these rock types and verified the marble and calcsilicate skarn logged by Gale. He further concluded that metasedimentary rocks are another new element that must be included in the north end of the Mount Lytton batholithic Complex. He further concluded that the best mineralization appears to be spatially related to pyroxene gabbro and pyroxenite.

The geological and petrographical evaluations by Dr. Gale and Dr. Read, respectively of the cuttings from the 1993 reverse circulation drilling program, coupled with a detailed review of the historical geochemical, geological and geophysical data provided the incentive to carry out the deep-probe IP-survey that is the subject of this report.

SECTION 6.0 — PHYSIOGRAPHY AND OUTCROP

The claims cover an area of moderate to steep topographical relief. The central and western part of the claims are traversed by a multiple switchback road that climbs the east side of the Thompson River canyon rising from the canyon bottom at 700 feet (213 m) elevation to a saddle between two peaks at 3,500 feet (1,070 m) elevation within a distance of 2 miles (3.2 km). This represents an average mountain slope of 26.5%. Locally the relief is moderate to steep in the area of interest, yet easily accessible by foot from the switchback road.

The area of interest is part of the Cascade Mountains which are separated from the Coast Mountains to the west by the Fraser River. The Thompson River meets the Fraser River at Lytton about 8 miles (13 km) west from the property.

The Cascade Mountains are lower and less rugged than the Coast Mountains and generally consist of rolling and rounded summits, which is the case at the higher elevations on this property.

Southern and western exposures on the property tend to be open areas and easily traversed, whereas northern and eastern slopes are much more heavily wooded. The area of interest on the property is a westerly-facing slope that has been logged of most of its old growth conifers. New growth is represented by denser deciduous trees and in places dense underbrush which makes it difficult to traverse.

Conifer species in the area include Douglas Fir, Balsam, Spruce and Lodgepole Pine.

Outcrop is generally lacking throughout the area of interest, so trenching is required to access the bedrock for mapping and sampling. Exposed outcrop over the entire property is estimated at not more than 15% of the surface area.

Overburden found in the percussion drill hole program of 1993 provides an overview of its anticipated range of depths to be expected over the main area of geological interest.

Drill Hole	Overburden Depth (feet)
93-1 (V)	10
93-2 (-61)	10
93-3 (V)	20
93-4 (-62)	10
93-5 (-60)	30
93-6 (-60)	135
93-7 (V)	130
V = Vertical Hole, all others nominally -60 degrees	

SECTION 7.0 — REGIONAL GEOLOGY

The regional geology is more recently described in the Geological Survey of Canada *Geology of Hope and Ashcroft Map Areas, British Columbia* by J.W.H. Monger and shown on Map 42-1989, Ashcroft, British Columbia, from which the salient features are shown on **Figure 3**.

As described by S.W. Smith, Geologist, in his 1993 Assessment Work Report, the property straddles the boundary between the older (Upper Triassic) Mount Lytton Complex on the west part and the younger (Middle and Upper Cretaceous) Spences Bridge Group to the east.

The Mount Lytton Complex has been interpreted by Monger to be part of the roots of the Late Triassic Nicola arc. The complex is fault bounded, on the west by the Fraser River fault system, and on the east by normal faults along the Thompson River. The Mount Lytton Pluton that is part of the complex has been age-dated at 212 ± Ma (Parrish and Monger, 1992), which is very close to some dates reported from the central Guichon Batholith, which is located about 40 km to the northeast and contains the world-class Highland Valley ore bodies. Parrish and Monger interpret the Mount Lytton Complex and Guichon Batholith bodies to be part of the Upper Triassic magmatic arc complex that characterizes Quesnellia terrane, but state that they were probably emplaced at different structural levels, as suggested by their contrasting settings.

Monger speculates that the major structures that form the Guichon Batholith and the Mount Lytton Complex are related to early Mesozoic subduction/arc activity; those in the Guichon Batholith having formed in the upper part of the upper plate and those in the Mount Lytton Complex having formed in the lower part of the upper plate.

The Middle and Upper Cretaceous Spences Bridge Group unconformably overlies and is in fault contact with the older Mount Lytton Complex.

In the area of the property, the Spences Bridge Group is relatively unaltered and consists of intermediate, locally felsic and mafic flows and pyroclastics along with sandstone, shale and conglomerate. It unconformably overlies an Upper Triassic/Lower Jurassic sequence of metasediments and metavolcanics believced to be part of the Mount Lytton Complex.

SECTION 8.0 - PROPERTY GEOLOGY & ALTERATION

A detailed geological map of the property surface geology is lacking; as is the subcropping geology in the area of the percussion drill holes because percussion drilling cannot provide the detail required to interpret structure. Hence very little is known of lithologic structure, mineralogic zoning, alteration facies zoning and the real extent of the zoning features. Surface mapping itself would provide helpful information as a prelude to further drilling. The most comprehensive and reliable geological mapping and identification of alteration is found in the drill hole logging undertaken by R.E. Gale, Ph.D., P.Eng. (1994) and the petrographical study of chips taken from cuttings from this drilling by P.B. Read, Ph.D. (1995).

The property appears to be bifurcated by Cretaceous volcanics to the east and Triassic intrusives to the west.

Some geological information that represents useful information was reported on by S.W. Smith, Geologist, in his 'Assessment Report', *Geological Mapping and Geological Sampling on the Ashton Property* of 20 September, 1993:

"On the east side of the property, the rocks are reddish coloured andesitic flows and pyroclastics of the Spences Bridge Group. They are relatively unaltered."

The rocks on the west side of the property where the copper in soils geochemistry was found to be significantly anomalous are believed to be part of the Mount Lytton Complex and were cursorily mapped as interbedded limestone and volcanic sediments with intrusive plugs or dykes of fine-grained diorite.

Smith (1993) reported: "The limestone varies from a clean white crystalline variety with a massive appearance to a thinly bedded grey silty variety. The limestone beds were noted to be from 0.5 to 5 m thick. Interbedded with the limestone was fine to medium-grained green volcanic tuff that was much wider in width. The volcanics were commonly limy. Locally these rocks were very strongly altered and fractured, with the strongest alteration seen in the vicinity of the old trenches in the northwestern portion of the Sheryl claim". (now the Rebecca 2 claim)

Diorite found in surface outcrop by the writer was dark grey to black, was intensely altered and was found to contain significant amounts of disseminated magnetite. A petrographic study of a representative sample was summarized by P.B. Read, Ph.D. (1990) as follows:

> "The original rock may have been a fine-grained pyroxene ? diorite but this rock has been nearly obliterated by an alteration assemblage of tourmaline-epidote-calcite-chlorite-sphene-pyrite which is cut by a few albite-calcite veinlets. The tourmaline is a major part of the alteration assemblage and indicates the presence of significant volatiles in the solutions causing the alteration"

According to Smith (1993), hydrothermal alteration of the volcanics was seen on a wide scale causing bleaching and quartz/carbonate veining within them. Epidote is the most common alteration mineral. Locally the diorite is so strongly altered that only epidote and magnetite can be seen. Secondary chlorite and calcite are also quite prevalent throughout the complex. The propylitic alteration (epidote, chlorite $\pm$ pyrite) identified in the volcanics and diorite provides surface indication that a significant porphyry style intrusive system underlies the area.

The 1993, 7-hole percussion drilling program provided a suite of typical drill-cuttings taken at 10 foot intervals for each hole. These cuttings were meticulously logged by R.E. Gale (1994) using a binocular microscope to provide some semblence of the subcropping lithology and alteration facies. This was the first opportunity to initiate an in-depth study of property geology.

Gale observed that there were at least three (3) distinct types of mineralized and altered intrusives within the subcropping area that include: diorite, gabbro and quartz diorite.

Part of Reid's (1995) petrographical study conclusions included " the drill chips indicate that pyroxene gabbro, pyroxenite and their altered equivalents are as widespread as horneblende diorite, horneblendite and their altered products. Gale's identifications (1994) of marble and calcsilicate skarn are verified and mean that metasedimentary rocks are another element that must be included in the north end of the Mount Lytton Complex".

Gale stated that mineralization occurs both as disseminated zones and mineralized vein systems, probably along the predominent northerly trend of structures noted in the area. Alteration in the form of calcite flooding and quartz and calcite veining was noted in all of the southernmost holes, RC93-1 through 93-5 and therefore is widespread throughout the latter area.

The marbleization and skarnification in the drill holes appears to increase easterly and southeasterly from the 1993 IP chargeability anomaly, and at depth.

Skarnification with significant copper mineralization is found in surface outcrop along the old logging cut east of drill hole RCA93-5 and and is also found sporadically in outcrop up to 600 metres southeasterly. The geochemical survey of 1969 also indicates small northerly striking anomalous copper-in-soils zones striking northerly within this 600 metre interval to the southeast.

Monger (1989) mapped a major normal-fault that strikes about north-south and appears to pass through Station 700 of the Deep-Probe IP survey Line 100-S. The fault extends northward to the Thompson River and coincides with it in undulating fashion with the northward extension of the river. The east side of the fault is down-thrown. No information on the fault's displacement is given.

A second major north-south striking normal-fault may lie between the west side of the intrusive complex and the Mount Lytton Batholith Complex in which case the intrusive complex may be bounded on each side by major fault structures.

SECTION 9.0 INDUCED POLARIZATION SURVEY

9.1 Introduction

A shallow-probe induced-polarization (IP) survey was carried out over the area of anomalous copper geochemistry by Lloyd Geophysics in 1993 to identify potential near surface drill targets.

The IP survey used a pole-dipole electrode array with an 'a' spacing of 50 metres. Four levels were surveyed which according to convention and common practice is believed to provide a nominal maximum penetration depth of the order of 140 metres (460 feet) below surface.

The survey was successful in delineating a significant IP anomaly with an average anomalous chargeability range between 7.5 milliseconds to 12.5 milliseconds above a much lower background. The anomaly was somewhat ellipsoidal in shape and was coincident with part of the large area of anomalous copper geochemistry. This IP anomaly covered an estimated 320,000 square metres or about 32 hectares (80 acres) within which at the time it was believed sufficient room was available to discover a large-tonnage low-grade open pitable copper deposit.

The results of the 1993 geophysical survey were enough to justify a drilling program to test its potential for a near-surface large-tonnage low-grade copper deposit.

Copper assay results from drill cuttings taken from the target area showed that very-low grade copper mineralization associated with pervasive alteration was widespread throughout all of the five holes drilled into the IP chargeability anomaly. Three of the holes were drilled to a total depth of 500 feet (152 metres) vertically.

The results from percussion drill hole RC93-3, located close to the central portion of the anomaly, was particularly interesting, relative to all of the other holes, for two reasons; the bottom 70 feet (20 metres) intersected a geologically significant, quartz-carbonate, pyrite-chalcopyrite stockworks zone, from which the bottom 50 feet (15 metres) assayed an average 0.10% copper. This grade of copper was more than double the average assay values obtained from the 450 foot (135 metres) section of hole above this interval.

It is speculated that this stockworks zone could be the roof zone of a mineralized porphyry system which leads to the possibility of finding an economic copper resource, in the classic sense, beneath it.

The 1993 drilling program and limited surface mapping showed an increase in marbleization and skarnification with depth in the easternmost drill holes and also in surface outcrop easterly and up to 1 km southeasterly from the drilled area. Abundant skarnification is found along a section of the old logging road between hole RCA93-5 and the main access road.

Gale (1994) in his drill hole logging identified significant skarnification and Read (1995) with his follow-up petrographical study of selected drill hole cutting specimens confirmed skarn minerals in drill holes: RCA93-1, RCA93-4 and RCA93-5.

The occurrence of the stockworks zone in the bottom section of drill hole RCA93-3 which was at the depth limit of the 1993 IP survey provided the incentive to carry out a depth probe induced polarization survey over the area of interest. An IP survey line was therefore chosen to cross this portended structure in a south-north direction making use of existing logging roads along a 30 degree azimuth track. This survey line was designated 100-West (100W).

Additionally the development of significant skarnification to the east of the drilled area provided a good reason to complete a depth-probe IP survey along an east-west section extending from an aeromagnetic anomaly as shown on **Figure 9** to intercept the 100-West line thereby allowing the survey to cross the main structure in an east-west direction also making the best use of existing logging roads along a 270 degree azimuth. This survey line was designated 100-South (100S).

Geological evidence supports the possiblity that two styles of mineral resource could underly the area of interest, a large-tonnage low-grade porphyry style copper deposit within the altered and mineralized intrusive system and a skarn-type massive sulphide copper deposit along the contact aureole with the volcanic-sedimentary complex to the east; and possibly to the north and south as well. The lithology to the west is believed to be the Mount Lytton Plutonic Complex.

The induced polarization survey was designed to provide a deep-probe, south-north and east-west depth profile across the area of interest. The IP probe would achieve an apparent depth of view up to six levels with an 'a' spacing of 100 metres. Such a probe may see the IP electrical characteristics of the rocks as deep as 420 metres (1,400 feet).

Prior to commencing the field work the Rebecca 2 and Rebecca 3 mineral claims were staked on June 28, 1999. The deep-probe IP survey field work, an intensive effort, was carried out on June 29 and June 30, 1999.

The following six personnel carried out the IP survey:

Personnel	Duties
J.M. Ashton, P.Eng.	Project Manager
D.G. Mark, P.Geo.	Geophysicist & Receiver Operator
Roderick Grummisch	Transmitter Operator
Will Markham	Placement of Current Electrode Cables, & Current Electrodes
Stephen Hodges	Placement of Potential Electrode Cables, & Potential Electrodes
Scott Hodges	Placement of Potential Electrode Cables, & Potential Electrodes

9.2 Survey Line Preparation

An assessment of the best plan of attack to carry out a deep probe Induced Polarization Survey taking the best advantage of the topography and old logging road system on the property was made during a field trip to the property on 5 May, 1999 by J.M. Ashton, B.A.Sc., P.Eng. Consulting Engineer & Explorationist; D.G. Mark, B.Sc., P.Geo., Geophysicist; and V. Austria, B.Sc.(Mining), M.Sc.(Geology), F.G.A.C., Consulting Geologist.

Grid preparation included using a combination of the old logging roads and a well travelled logging road that almost bisects the north half of the property. Two Survey Lines were set out, Line 100W which was surveyed first and Line 100S which was surveyed last. Each survey line was located by compass azimuth. The two lines were tied to the roads, the existing property

grid, specific drill site locations, and legal corner posts of the respective claims.

Compass declination used was 22 degrees east as defined by N.T.S. Map Sheet 94D.

The potential electrode cable provided the necessary distance measurement and survey station locations because the cable was complete with potential electrode connections at every consecutive 50 metre mark along its length. Although this survey used an "a" spacing of 100 metres, every second tap of this cable was used for the potential electrode connections. Once the cable was properly positioned each connection location was marked with flagging.

Clinometer readings were taken between each electrode station to provide a ground elevation profile which was used in conjunction with the computer generated induced polarization survey chargeability and resistivity pseudosections; and self-potential response profile.

A total of 4.2 km of IP survey was completed.

9.3 Instrumentation & Data Management

The induced polarization survey equipment consisted of an engine-generator set (energy source), transmitter, electrode switching network, receiver, electrodes and cables.

The **engine-generator set**, manufactured by Honda, had a rated generator output of 4.0 kW at 1,200 Volts ac. The engine was rated at 6.5 horsepower. The engine-generator unit is the power source for the transmitter unit.

The **transmitter unit** was a Model VIP 4000 (4.0 kW maximum output) manufactured by BRGM (Bureau de Recherches Géologiques et Minières) of Paris France.

The **receiver unit** was a Model ELREC 6 manufactured by BRGM. This unit is of advanced technology complete with software controlled algorithms and functions and is fully programmable through a keyboard on the front panel. Survey data is easily read by means of a digital readout on the front panel. The receiver system is capable of time domain and frequency domain chargeability and resistivity measurements and complex resistivity measurements.

A multi-electrode switching network operated by the Receiver Operator provided the required voltage inputs from the voltage sensing electrodes to the Receiver in an organized consecutive manner to facilitate multi-level readings.

The data recovered was managed by a computer software program developed by Geosoft Inc. of Toronto, Ontario. The program has been modified by Geotronics Surveys Inc. to suit its application requirements. This software program performs resistivity calculations, pseudosection plotting, survey plan plotting and contouring.

The apparent-chargeability values are read directly from the receiver and were stored in the receiver memory. No data processing is required prior to plotting. Whereas apparent-resistivity values which were derived from current and voltage readings taken in the field were also stored in the instrument's memory but were later, as a matter of data processing, were combined with the appropriate geometrical factor for the dipole-dipole array to compute, through an algorithm, the actual apparent-resistivity value used for each sample point.

9.4 Theory of Earth Resistivity & Induced Polarization

In general earth resistivity is the resistance of rock to the passage of electric current. By applying a potential difference or voltage from a current source across two electrodes separated by distance and connected electrically with the earth an electrical current will flow.

The amount of current through the earth is in accordance with Ohms Law, e.g. $I = E/R$ where I = current in amperes, E = voltage in volts and R = resistance in ohms. R is calculated in accordance with the expression, $R = pL/A$ where: p = resistivity of the earth in ohm-metres; L = length of conducting path in metres, and A = cross sectional area of the path in square metres.

Current flow through the earth, or ground follows the path of least resistance known as low impedance paths, which is mainly through the electrolyte filled capillaries within the pore spaces of the rock. However when electrically conductive minerals are present, i.e. minerals that facilitate the passage of electrons, which includes: most metallic sulphides, except sphalerite; some oxides; graphite; and metallic elements such as native copper and silver; then the electrical current will preferentially flow through these materials because they represent low impedance paths.

Where, for example, a bulk quantity of interconnecting sulphides is found either in the disseminated form or semi-massive to massive form then the electrical current will largely flow through this zone of low resistivity or high conductivity. A voltage probe placed anywhere on such a conductive body would find that relative to any remote probe on the same conductive body the voltage at both probe points would be the same; or if not, the voltage difference would be small.

The induced-polarization effect is a very complex electro-chemical phenomenon that occurs when current flow in rock is dependent upon the electro-chemical effects of the solutions of electrolyte that fill the pore spaces of the rock adjacent to clusters of metallic minerals or other electronic conductors. Current flow in this instance is maintained by charged ions in the solutions.

The induced-polarization (IP) effect occurs where the method of electron transport is changed from ionic conduction to electronic conduction at the interface between the electrolyte in the pore space and the metallic conductor particle. The effect at the interface is one of induced-polarization whereby a micro-voltage probe across it will detect a step voltage when electrons (current flow) are moving across it.

The total voltage drop across the electrolyte and conductive minerals that are normal to the current flow direction is the sum of the voltage drops across the electrolyte and the conductive mineral. An ion capable of transporting an electron that approaches this interface during current flow that does not have sufficient energy to overcome the over-voltage cannot accept an electron from the conductive mineral's crystal lattice in which case the charged-ion will remain at the surface. This mechanism effectively reduces the current flow across the interface. With time, additional ions incapable of accepting electrons because they cannot cross the barrier will pile up at the interface and reduce the flow of electrons even further through increase of the apparent resistance. Rapid cyclic reversal of voltage, or current flow, will decrease this apparent resistance.

In addition to the induced-polarization effect there is an electrolytic (membrane) polarization effect caused by the passage of electrons through the electrolyte-filled pore spaces that occupy portions of the rock space that do not include conductive minerals.

The electrolyte conduction mechanism is limited by the fact that most rock forming minerals have a net negative charge at their interfaces with contained pore fluids which causes attraction of positive ions at the interface and repulsion of negative ions. This results in a polarized

distribution of ions with a limited number of current carrying positive ions available thereby limiting the current flow capability.

This effect is greatest in the presence of clay minerals when extremely small passage ways between clay sheets may permit no movement of ubiquitous negative ions thereby blocking the passageways to potential current carrying positive ions. Of the two effects, induced-polarization which requires the presence of conductive minerals has the largest magnitude.

The induced-polarization measurement technique is a procedure which measures the transient flow of charged ions as a voltage following the abrupt termination of the externally applied voltage, and as a result, the current flow. The transient voltage waveform that is measured decays to zero within a short period following interruption of current flow.

9.5 Preparation of Results

The induced polarization apparent chargeability value for each point measured is read directly from the BRGM Model ELREC 6 receiver unit. A calculation algorithm within the unit computes the chargeability and displays the result on the receiver. Discharge current into the ground and potential difference across current electrodes is data which is manually entered into the receiver computer whereas voltage values from each sensing dipole are automatically entered into the receiver unit to enable apparent chargeability calculation. Voltage value inputs from each receiving dipole into the receiver is facilitated by a multi-conductor cable which connects each receiving electrode on the survey line with the receiver. Apparent resistivity is computed using discharge current into the ground, potential difference between potential electrodes and a geometric factor which essentially represents the apparent volume of rock samples within the potential dipole.

The transmitter operator reads the discharge current between the current electrodes for each group of measurements made pursuant to a specific dipole location and radio transmits this data to the receiver operator for his use in the required calculations.

Chargeability and resistivity data is automatically recorded for later data reduction and preparation of pseudosections with the aid of a computer and plotter.

The software program used for plotting pseudosections of chargeability and resistivity is one

developed by Geosoft Inc. of Toronto and modified by Geotronics Surveys Ltd.

Chargeability and resistivity data were computer-plotted in pseudosection format for each IP line surveyed with results shown in **Figure 4**, Line 100W, Apparent Resistivity & Chargeability Pseudosections with Self Potential Profiles; and **Figure 5**, Line 100S, Apparent Resistivity & Chargeability Pseudosections with Self Potential Profiles. **Figures 6 and 7** were prepared for display of key interpretation features.

9.6 Salient Interpretation Features

9.6.1 **Resistivity**

The bulk resistivity of rock varies with age, permeability, porosity, the volume of conductive elements present and the salinity of contained water.

Zones of low apparent resistivity interpretation possibilities include: fault zones, shear zones, zones of alteration, rock units that are relatively more porous than their confining rock units, and conductive sulphides that could represent ore.

According to Grant et al (1965), the presence of clay in the pores of rock has a considerable effect on its conductivity. The clay minerals and other hydrous substances such as serpentine are generally found to be rather good conductors and with the addition of a small amount of excess water will increase the conductivity significantly due to ion-exchange. Dry clay itself is usually not a good conductor.

9.6.2 **Induced-Polarization Effect**

The magnitude of the induced-polarization "chargeability" effect is dependent upon several variables, including:

- electrolyte medium
- porosity
- conductive mineral concentration

The chargeability is of greater magnitude when conductive minerals are disseminated through

the rock hence observation of the effect within a volume of rock is very useful in determining whether disseminated sulphides are present and their relative abundance. Some simple rules of the IP or overvoltage chargeability effect include:

- for a particular concentration, the IP effect decreases with rock porosity.
- a larger IP effect occurs in a disseminated sulphide deposit within dense igneous rock than in more porous rock.
- the overvoltage or IP effect varies inversely with the current density.
- the IP effect decreases with increasing frequency.

Induced-polarization chargeability measurement involves measuring the bulk chargeability of the volume of rock between the receiving or voltage sensing electrodes. Should the electrode interval chosen be much wider than the zone of sulphide mineralization, then the chargeability value measured will be much smaller over the larger distance than it would otherwise be measured over the shorter electrode spacing because included in the measurement will be the effect of the non-sulphide portion of the zone. In the limit as the electrode spacing is reduced to the size of the sulphide body only then will a true measurement of the body's chargeability be made. However the anomalous pattern and IP magnitude will be much the same regardless where the sulphide source is positioned relative to the electrodes.

9.6.3 **Self-Potential Measurements**

Spontaneous polarization, or self-potential (SP) as it is generally known is an electro-chemical phenomenon. Several theories have been put forth to describe the electro-chemical mechanism however in its simplest construct during the oxidation process of a sulphide body in the ground, electrons are transported from the sulphide body at depth to the oxidizing zone near the surface which results in a negative potential at the centre of the zone of oxidation.

Smaller amplitude time-varying self potential effects are common on the earths surface due to telluric currents which are generated by the Magnetotelluric field between the earths surface and ionosphere.

Self-potential measurements in millivolts (mV) were made at each pair of potential electrodes prior to taking induced polarization chargeability readings because this electric field effect generally measuring in millivolts, positive or negative, must be nulled prior to taking IP chargeability readings which are also measured in millivolts, because the IP readings would otherwise be biased and inaccurate.

With this IP equipment the self-potential gradient is measured between the two voltage sensing electrodes hence in the interpretation the greatest change in electric-field strength occurs above the zone of oxidation when this is the source of the effect. Hence in interpreting the location of a sulphide body when a significant negative SP effect is observed it is generally below the crossover point when the SP characteristic goes from positive to negative.

Telford et al (1976) p.467 show a 100 foot (30 metre) vertically thick semi-massive to massive sulphide zone with its top at about 300 feet (100 metres) below the surface causing a surface self-potential effect of -130 mV.

According to Burr (1982) oxidizing sulphides will produce a range of up to 350 mV between the most positive and most negative SP readings. Accordingly part of the interpretation exercise for the SP gradient plots shown in this survey is to add the adjoining positive and negative values on both sides of the crossover anomaly to determine the absolute strength of the SP anomaly.

9.6.4 **Induced Polarization Measurements**

The induced polarization effect is measured either in the time domain or the frequency domain. As a direct consequence of generating these variables rock resistivities can be calculated.

Time domain induced polarization measurement involves comparing the residual time varying voltage V(t) at a time t after charging current is shut-off along with the initial impressed steady state voltage V_c which causes current flow. The residual voltage V(t) is measured after a brief interval yet before it decays to noise level following current cut-off to preclude false readings which occur due to transients immediately following current interruption. See **Figure 9.2**.

Because V(t) is much smaller than V_c the ratio units are millivolts/volt and upon integration with time the measured induced polarization units become millivolt-seconds/volt. By definition "chargeability" is the following integral:

$$C = \frac{1}{V_c} \int_{t1}^{t2} V(t)\, dt$$

Frequency domain induced polarization measurement involves measuring the apparent resistivity under direct current input into the ground and the apparent resistivity under higher, yet very low frequency, frequency current input into the ground, usually at two frequencies in the range between 0.10 Hertz and 10 Hertz and is defined by the equation:

$$PFE = 100\ (p_{dc} - p_{ac})/p_{ac}$$

PFE = Percent Frequency Effect

The resistance produced at the (electrolyte)-(rock particle or conductive particle) interface decreases with increasing frequency.

9.6.5 **Mineralogy & Site Specific Geology**

Detailed geological and petrological logging of drill chips from the 1993 reverse circulation percussion drilling program showed that copper mineralization occurs both as disseminations and vein systems within the altered intrusive complex.

Alteration in the form of calcite flooding and quartz and calcite veining was found in all of the southernmost holes which penetrated the altered intrusive complex.

The intrusive complex contains a variety of styles of conductive minerals including disseminations of magnetite, pyrite and chalcopyrite. Non-conducting disseminations of hematite are also present.

Magnetite disseminations occur in coarse to fine grained altered diorite and diorite porphyry ranging up to 15% by volume. A magnetite content between 5% and 15% appears to cover the ranges observed in this rock type.

Pyrite up to 5% is found in leucodiorite and the more felsic phases of the intrusive complex. Magnetite in these rocks is much diminished compared with the larger concentrations found in the diorite and diorite porphyry.

A 70 foot section at the bottom of drill hole RC93-3 contained a stockworks of quartz-calcite, pyrite-chalcopyrite veinlets from which the bottom 50 feet assayed an average of 0.10% copper.

A 20 foot section of drill cuttings from hole RC93-5 contained a magnetite-poor silicified to highly calcareous diorite with 2% disseminated pyrite-chalcopyrite which averaged 0.12% copper over 50 feet. Ten (10) feet from this section of cuttings assayed 0.29% copper which was the highest assay returned from sampling the five holes within the altered intrusive complex. Possibly silicification accompanies the better grades of copper within this system in which case one would want to target for drilling those induced polarization zones that exhibit coincident high chargeability with higher resistivity responses.

Zones of skarnification occur in drill holes RC93-1, RC93-4, and RC93-5; and skarnification is found in outcrop east and south of drill hole RC93-3 and around holes RC93-4 and RC93-5.

Antal (1969) reported assay results from samples taken along a 270 foot section of trench in chalcopyrite and malachite mineralization in skarn near drill hole RC93-5 (drilled in 1993). A 35 foot section of this zone reportedly assayed 0.73% copper. Southeast from this trench Antal reported occurrences of bornite in association with chalcopyrite.

Gale (1992) examined Antal's trench and concluded that it did not cut the structure normal to it and that the true width of the 35 foot section reported by Antal was only an estimated 5 metres (about 16 feet) wide at best. One grab sample from this higher grade section submitted to the assayers by Gale assayed 0.56% copper.

Smith (1993) reported an average assay of 0.57% copper across 3 metres of skarnification in outcrop along an old logging road cut 150 metres northeast of the Antal trench.

Smith (1994) discovered two other zones of skarnification containing copper minerals in outcrop south of drill hole RC93-5. Zone 1 assayed an average of 0.29% copper across 8 metres and Zone 2 assayed an average of 0.28% copper across 7 metres. Zone 2 showed slightly anomalous values in gold and silver from three of the 8 one-metre intervals sampled.

9.7 Survey Procedure

For this survey the induced-polarization apparent chargeability and apparent resistivity measurements were made in the "Time-Domain" mode. In this mode, **Figure 9.1**, the transmitter produced a positive square wave pulse for a period of 2.0 seconds then shut off for 2.0 seconds then pulsed a negative square wave pulse for 2.0 seconds and then shut off for 2.0 seconds. This alternating cycle of square wave pulses repeated itself for each 8.0 second period.

The overvoltage value V_c was read across the potential electrodes during the duration of each square wave pulse at the receiver. At the termination of each square wave pulse a 200 millisecond time delay was maintained after which the decay voltage V(t) was integrated over a series of 10 time periods for a total integration time of 1500 milliseconds. See Figure 8.2.

This survey used the double-dipole electrode array. This configuration was chosen because of its efficiency and practicality. It takes less time to lay out and recover the current and potential electrodes than other electrode arrays and the operating procedures are generally less complex.

The double-dipole measurement technique has been shown to provide maximum sensitivity to the lateral variations of electrical properties in the earth hence it is the most effective technique for identifying smaller structures such as veins and narrower massive sulphide bodies.

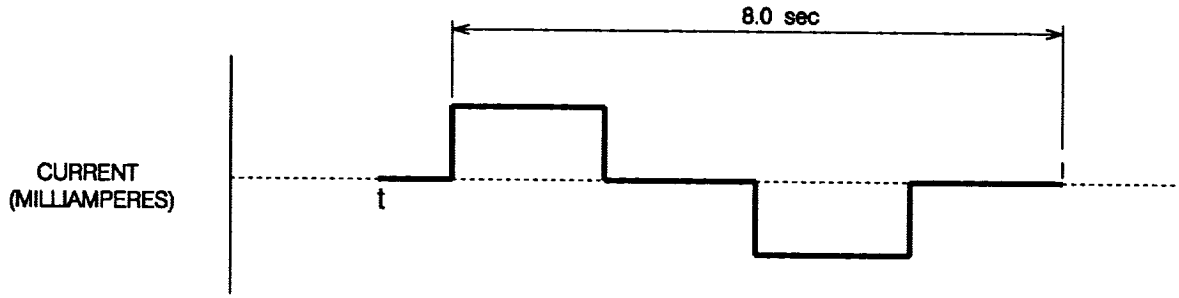
It also provides the sharpest and largest magnitude anomaly of a spherical type conductor at depth.

The chargeability and resistivity values measured were plotted in pseudosection format which was successfully developed by P.G. Hallof, Ph.D., of Phoenix Geophysics Limited in 1963.

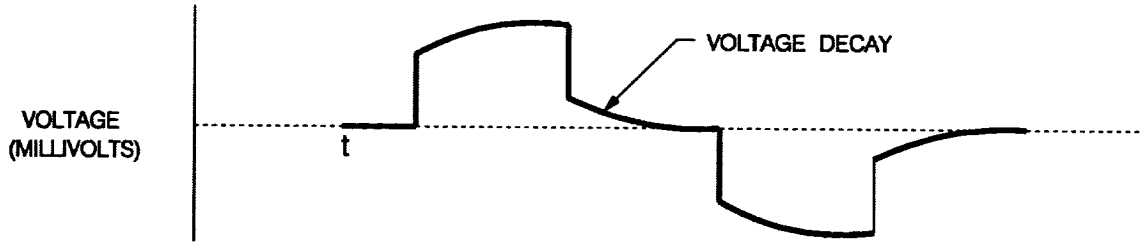
With this procedure, see **Figure 9.3**, current is applied by the transmitter across the two current electrodes a distance 'a' apart.

The receiver measures the potential across the two potential electrodes also spaced a distance 'a' apart. the distance n x a (n is a whole integer) is the electrode spread distance and represents the distance between the closest or innermost current and potential electrodes.

The plotting point as is shown on Figures 3 and 4 is the mid-point between current and potential electrodes or at an angle of 45 degrees from the centre of each electrode group.

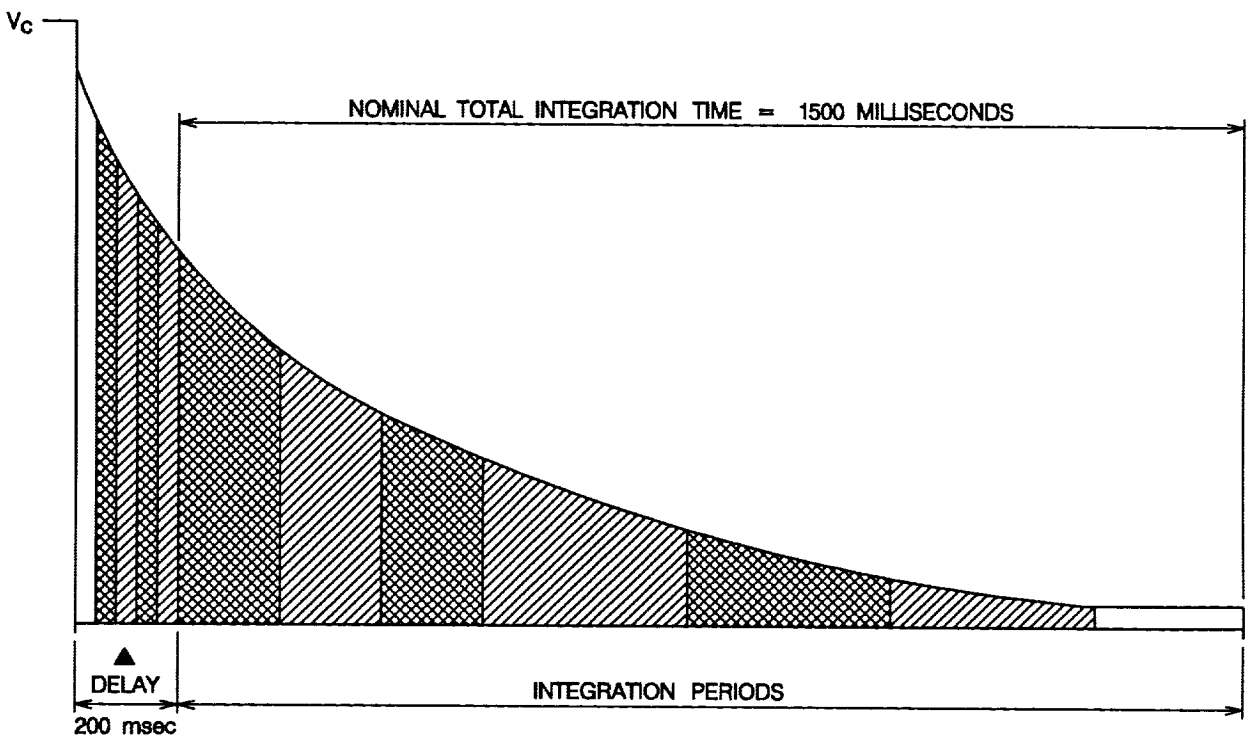


TRANSMITTED CURRENT WAVEFORM



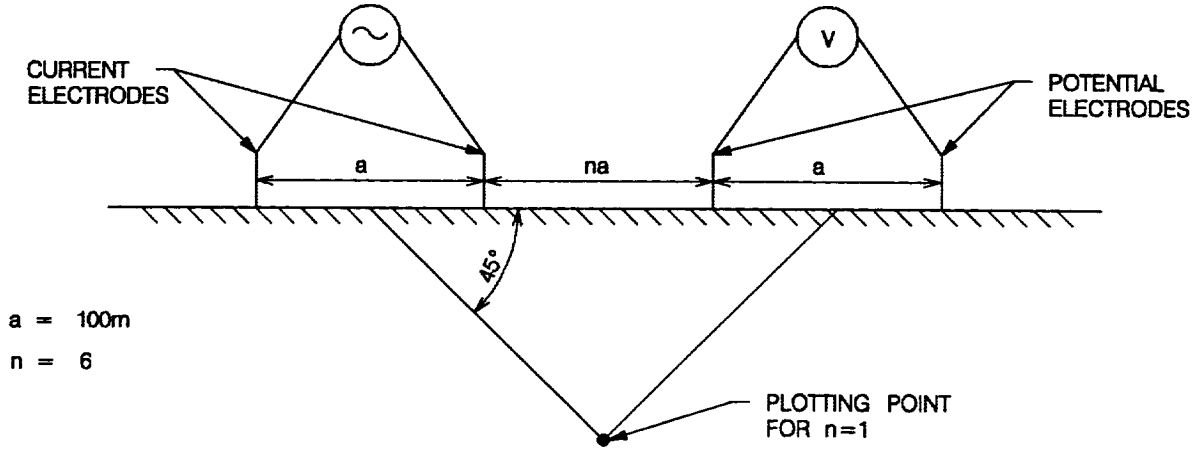
VOLTAGE RESPONSE

FIGURE 9.1



IP INTEGRATION CHARACTERISTIC

FIGURE 9.2



DOUBLE-DIPOLE ARRAY

FIGURE 9.3

This plot-point location is entirely arbitrary however in practice it generally provides the best fit. For the depth probe survey on the Ashton Copper Prospect the maximum spread measured was n=6 which enables the development of a pseudosection plot to a theoretical depth of 600 metres multiplied by the cosine of 45 degrees which is 424 metres (1,400 feet).

Current electrodes used were made up of groups of three stainless steel rods which were hammered into the ground with a sledge hammer to provide good electrical contact. The current electrodes were bathed in 5% solution of salt water to provide low contact resistance. The rods were connected to the current conductors with insulated stranded copper conductor.

Potential electrodes used were single stainless steel rods which were hammered into the ground with a sledge hammer. The current electrodes were bathed in 5% solution of salt water to provide low contact resistance. The rods were connected to the multi-core potential sensing cable with insulated stranded copper conductor.

The stainless steel potential electrodes proved to be every bit as good as porous, unglazed, porcelain pots containing a central copper electrode placed in a bath of highly conductive copper sulphate electrolyte solution which might normally be the conventional approach.

Conductors providing power to the current electrodes from the transmitter were made up of single conductor flexible copper wire with pvc insulation.

As stated a specially designed multi-conductor cable which permits connection of all potential electrodes simultaneously to the receiver was used.

9.8 IP Survey Results & Interpretation

9.8.1 General

Results from the deep-probe IP included apparent resistivity values, and apparent chargeability values plotted in pseudosection; and self-potential profiles as measured across each potential electrode pair.

Interpretation of the chargeability and resistivity results were made from the pseudosections plotted as **Figure 4** and **Figure 5** for the two line deep-probe survey. Interpretation is a complex

and largely subjective issue particularly when there is no data available on the electrical properties of the subcropping lithology. Therefore quantification of the results can not be presented.

The interpretation of the self-potential results were also made on the basis of subjective wisdom.

It is important to recognize that the measured values shown on pseudosection are apparent values of chargeability and resistivity only. The apparent effect is influenced by many variables and includes size, depth, attitude and electrical properties of the source and the electrode interval used. Grain size of conductive material (sulphide mineralization) and whether there is continuous or discontinuous interconnection of the grains will affect the apparent chargeability values.

Hence the interpretation of apparent chargeability and apparent resistivity cannot be too detailed because of the complex interaction of many dependent and independent variables.

However inspection of the relative quantitative chargeability and resistivity values displayed on the pseudosections can provide diagnostic support as to the probable extent of the anomalous zones and the possible causes of the electrical phenomena observed. Results from previous geochemical, geological and geophysical data, does assist interpretation of the IP results.

Copper assay results from percussion drill holes RC93-1 to RC93-5, inclusive, for a total length of 676.8 metres (2,220 feet) averaged 554 ppm copper. The anomalous copper content of the large volume of altered-rock tested is geostatistically significant and indicates that the system could contain a copper resource somewhere within the zone of alteration.

The interpretations that follow were made on the basis of inspection of the IP data gathered in this survey in conjunction with knowledge of the historical geology, geochemistry and geophysics. Pattern recognition also played a role in the interpretation.

By inspection, and only for the purposes of discussing and presenting the results of this IP survey the following chargeability and resistivity ranges were chosen to correspond with the relative weighting of each measured effect. The principle of geometrical progression was applied.

Chargeability Range (milliseconds)	Weight
3 and less	Low (Background)
greater than 3, less than 6	Moderate
greater than 6, less than 12	High
greater than 12	Very High

Resistivity Range ohm-metres	Weight
10 and less	Extremely-Low
greater than 10, less than 20	Very-Very Low
greater than 20, less than 100	Very Low
greater than 100, less than 200	Low (Background)
greater than 200, less than 400	Moderate
greater than 400, less than 800	High
greater than 800, less than 1,600	Very High

Because this survey used an "a" spacing of 100 metres (328 feet) a smaller average chargeability effect over the larger width sampled could represent the integral combination of a narrower high chargeability zone coupled with a much lower chargeability envelope to provide the plotted average result. This becomes an important issue if the electrical characteristic sought after is a zone of high chargeability.

9.8.2 **Explanation of High Conductivity Zones with No Corresponding IP Effect**

As can be seen on the two pseudosections of original data and more particularly with the high-conductivity Primary IP Anomaly II no corresponding chargeability effect is plotted. This indicates that no IP effect could be measured. It does not mean that there is no IP effect.

In order to measure the IP effect it is necessary to measure V(t) in millivolts and integrate its decay over time to produce the product millivolt-seconds. However when a highly conductive body within the earth's crust is sampled using the IP technique the measured voltage-drop across the conductor is directly proportional to its average resistance in accordance with Ohms Law, V=IR. However when the resistance approaches zero, as in the case of a very good conductor, the voltage-drop approaches zero for each unit of current which will result in very-low voltages seen across the potential electrodes. As this voltage drop approaches zero, in millivolts, the signal to noise ratio also approaches zero and the chargeability cannot be read. The IP Receiver chargeability calculating algorithm rejects the signal because it is not possible to read it.

There are three unique extremely-low to very-low resistivity zones measured by this deep-probe IP survey and all are formed along the contact zone between the intrusive complex and intruded lithology. Each very low resistivity zone translates into a conductivity-thickness electrical value in mhos that is consistent with what a low conductivity massive-sulphide deposit would exhibit if measured with electrical instrumentation.

The most prominent conductivity zone, and the one which is closest to the surface, is identified as Primary IP Anomaly II which subcrops at the east wall of the intrusive complex contact zone; followed in increasing order of conductivity-thickness by IP Anomaly III which subcrops on the north hanging wall of the intrusive complex contact zone and IP Anomaly IV which subcrops at the south contact, or footwall zone of the intrusive complex.

9.8.3 **Explanation of Negative IP Effect**

Negative IP occurs when the depolarization current direction is in the opposite direction from the polarization current. In the normal positive IP response the depolarization and polarization current directions are in the same direction.

9.8.4 **Self-Potential Effect**

The self-potential (SP) results are most subjective and may only be a guide to the fact that an oxidation-reduction reaction is occurring at depth; however economic sulphide deposits have been discovered using this cost effective tool. The SP effect has been successful in detecting economic massive-sulphides down to 150 metres (500 feet) total depth.

The subject is complex, as the low impedance paths that electrons are known to follow in the oxidation-reduction reaction are believed to be dependent upon both the geometry and concentration of sulphides and the available electrolyte paths all of which can influence the location of the conducting paths. Therefore deviations from this general rule can be expected.

The large chargeability anomaly in the vicinity of drill hole RC93-1 and RC93-2 is bounded on its north and south edges by a self-potential anomaly of -136 millivots and -76 millivolts respectively. These values are consistent with the oxidation-reduction processes of sulphides at depth.

9.8.5 **Line 100 West; Results & Interpretation**

Apparent chargeability, apparent resistivity and self-potential values measured for Line 100-West are shown in pseudosection in **Figure 4**. The electrical features from the data of Figure 4 which are believed to be significant and are the focus of the interpretation discussion are displayed in **Figure 6**.

9.8.5.1 **Line 100W, Primary IP Anomaly I**

Only a coarse correlation between apparent chargeabilities and apparent resistivities could be made between the 1993 survey with this one. This comparison could only be made from the 1993 4th level results at a nominal 140 metres depth with the 1999 2nd level results of Line 100-S also at a nominal 140 metres depth.

For apparent chargeability readings a comparison was possible as the readings had a satisfactory positive correspondence. It showed that the 1993 results across the one close fitting comparable section had greater apparent magnitudes than the 1999 survey by a factor of 1.5. Hence chargeabilities read for this 1999 survey multiplied by 1.5 provide a rough guide as to the relative chargeabilities. It indicates for example that the chargeabilities encountered at depth in the 1999 survey are significantly higher than the chargeability isogons within the first 140 metres of the surface as measured by the 1993 survey.

For apparent resistivity magnitudes no valid comparison was possible between the 1993 results

and these 1999 results at the fourth level as the compared sampling points were too scattered to have any correlative validity.

Line 100-West pseudosection shows a zone of high chargeability, i.e., greater than 6.0 milliseconds (ms) to a maximum of 11.0 ms within the central section that extends to depth. The average cross sectional width was estimated at 250 metres from the first level sampled at 70 metres to a total depth of 420 metres (1,400 feet). This chargeability anomaly forms part of IP Anomaly I. The resistivity measurements form the other component part of this IP anomaly.

At Level 4, estimated at 280 metres (920 feet) depth the high chargeability zone that is 270 metres (890 feet) in width and correlates with a central high-resistivity core which has a maximum reading of 1,290 ohm-metres. The combination high chargeability-high resistivity could represent conductive sulphides within a silicified zone as was the case at Valley Copper, Osatenko (1976) and is therefore considered the primary target zone for the discovery of disseminated copper-sulphides.

Drill hole RC93-1 which was drilled above this primary target was stopped short of it by about 50 metres, hence did not penetrate it. However the bottom of this hole contained 54 metres (110 feet) of 0.11% copper which was a significant increase in values from those obtained near the top of the hole.

9.8.5.2 **Line 100W, Resistivity Anomaly III**

A prominent zone of very-low resistivity forms along the hanging wall section of Chargeability Anomaly I on Line 110W below Station 800 with its top subcropping at an estimated 230 metres (750 feet) below surface. This feature is designated as Resistivity Anomaly III.

This feature has an average resistivity of 35.3 ohm-metres, or over its sampling width of 100 metres has a calculated conductivity-thickness of 2.8 mhos. This zone has a corresponding negative IP effect.

Table 9.1 Conductivity-Thickness Values for Resistivity Anomaly III

The pseudosection, Figure 6 includes three (3) very-low resistivity readings; 47, 25, & 34 ohm-metres respectively, with an average of 35.3 ohm-metres for the entire electrical structure.

Apparent Resistivity (ohm-metres)	Conductivity mhos/metre	Width metres	Conductivity Thickness
25.0	0.04	100	4.0 mhos
25.0	0.04	50	2.0 mhos
25.0	0.04	10	0.40 mhos
35.3 (Avg)	0.028	100	2.8 mhos

Projecting this zone vertically to surface there is no corresponding copper anomaly however there is skarn development in nearby drill hole RC93-1 and to the immediate north and east there is large anomalous VLF-EM zone determined in the 1990 survey.

9.8.5.3 **IP Anomaly IV**

There is a coincident medium chargeability and high resistivity anomaly identified as IP Anomaly IV, which subcrops at about 150 metres depth below Line 100W, Station 1100.

This feature could represent a much narrower sulphide bearing structure with significantly larger chargeability and resistivity values, or it could represent the edge of a neighboring electrical structure located to the east or west.

There is no known geochemical response at surface here. However there appears to be a VLF-EM anomaly, Ashton (1990), nearly co-incident with this subcropping IP anomaly top below Line 100W Station 1100 that could be a large dimension feature. It is a diffuse, low amplitude VLF-EM response which projects into the central part of Primary IP Anomaly I.

Additional support for sulphides at depth in this zone is a minus 147 millivolt Self Potential response centered at Line 100W, Station 1100.

The crossover points from positive to negative of the self-potential readings tend to overlie the oxidizing sulphide mass that causes the SP effect.

9.8.5.4 Negative IP Effects

A negative IP effect is found coincident with the very-low resistivity anomaly located below Station 800 and a negative IP effect is found coincident with a low resistivity zone below station 400. These negative IP effects are occurring on both sides of the large chargeability Anomaly I (chargeable body) centered at Station 600.

This is not inconsistent with the fact that negative IP has been observed to occur on both sides of a chargeable body, when the location of the survey line relative to the chargeable body with the chargeable body being close to the surface relative to the electrode spacing.

9.8.6 Line 100 South; Results & Interpretation

Apparent chargeability, apparent resistivity and self-potential values measured for Line 100-South are shown in pseudosection in **Figure 5**. The electrical features from the data of Figure 4 which are believed to be significant and are the focus of the interpretation discussion are displayed in **Figure 7**.

9.8.6.1 Line 100S; Primary IP Anomaly I

Line 100-South pseudosection shows a zone of high chargeability from Station 1600 to where it intersects the well defined anomalous section of Primary IP Anomaly I of Line 100-West at Station 1950. This anomaly is open to the west. This large anomaly which is clearly shown in pseudosection for Line 100W and Line 100S is designated Primary IP Anomaly I and was the major target area for depth definition by this deep-probe IP survey.

At Level 4, within this chargeability anomaly at 280 metres (900 feet) depth, the 6.0 ms high chargeability isogram begins at about Station 1600 and extends at least to Station 2000 West or to this lines intersection with Line 100-West. Its total width at this depth is at least 400 metres and it is open to depth. Within this zone of high-chargeability there is an apparent high-resistivity zone, with resistivities greater than 400 ohm-metres, and includes values as high as 1058 ohm-metres. The high-resistivity zone at Level 4 appears to begin at Station 1400 and extends to at least Station 1900 for a total width of 500 metres. This section of anomalous IP response is part of the zone of interest.

9.8.6.2 Line 100S: Primary Resistivity Anomaly II

At Level 4 about 160 metres east of the 6.0 ms chargeability isogram of Primary IP Anomaly I is an extremely-low resistivity anomaly, **Primary Resistivity Anomaly II**, that could be as much as 100 metres in thickness. At Levels 2, 3 and 4 it has an apparent-resistivity of 7.0 ohm-metres; at level 5 it has an apparent resistivity of 18 ohm-metres; and at level 6 it has the lowest reading of the survey at 2 ohm-metres. The highest reading at 18 ohm-metres has an associated high chargeability of 8.0 ms on its west flank which indicates that it may have a disseminated or semi-massive sulphide association. The 2 ohm-metre reading has a negative chargeability effect on its west flank.

Primary Resistivity Anomaly II subcrops an estimated 130 metres (430 feet) below surface and has an easterly dip of about minus 35 degrees which is close to the dip-angle of the meta-sediments described by Antal (1969). Its true strike direction cannot be fully assessed with a single-line of deep-probe IP crosscutting this electrical structure however a strong linear copper geochemical anomaly and a coincident linear two station VLF-EM anomaly, which both strike north-south, appear to also coincide with the strike axis of this IP anomaly.

The copper-in-soils anomaly located above Primary Resistivity Anomaly II extends both south and north. Its total strike distance is 1,100 metres. 250 metres north from this point of coincidence a two-station VLF-EM anomaly, Ashton (1990), follows the copper anomaly for at least 600 metres further northward. The area to the south of the two station VLF-EM anomaly on Line 5000N has not been surveyed so it is open to the south towards Primary Resistivity Anomaly II. It probably continues to Primary Resistivity Anomaly II as the VLF-EM effect is very strong here.

The extremely-low resistivity anomaly continues to depth on a down-dip extension of 320 metres (1,000 feet) from its top and is open to depth. This feature does not exhibit any chargeability effect except at Level 5 where it intersects an 8.0 ms chargeability isogram; which may be significant as the nearly coincident high chargeability and extremely-low resistivity is a classical indicator of disseminated and semi-massive sulphides.

The extremely-low apparent resistivities are plotted on the pseudosection with a calculated sampling width of 100 metres. Given that this is an extremely-low resistivity over a large sampling interval and equates to a high conductivity we shall deal with this item in terms of conductivities.

$g = I/V$ where g = conductivity in mhos

Hence for a constant current flow and a very small voltage drop across a sampling interval (as in the case of a very good conductor), conductance (and relative conductivity-thickness) will be high and be indicative of a good conductor.

Alternatively as in the case of a poor conductor, for a constant current flow, and a high voltage drop (i.e., a poor conductor) the conductance will be very low.

Hence in the case where a sample space is made up of a parallel series of variable conductivity elements in the direction of current flow, the total conductivity through the zone will be the sum of the conductivity elements in accordance with the following relationship, or <u>conductances in parallel</u> add algebraically:

$$g_T = \sum_{i=1}^{i=n} g_i$$

Hence each conductive element g_i must have a conductivity less than the total g_T. Therefore where a series of conductive elements are in parallel and integrally measured in the sample space a high conductivity measurement indicates that some of the elements could still be of low conductivity integral with high conductivity elements such as not to exceed the total value of g_T; or a highly conductive pathway through an array of low conductive elements will still see the measurement of a good conductor. This effect could also be caused by a conductive fault or shear zone provided it had the correct geometry; or highly conductive massive sulphides.

In the case where the sample space is made up of a series of variable conductivities normal to the direction of current, as for an array of alternative high-resistive and low resistive slices the total resistivity through the zone will be the sum of the resistivities in accordance with the following relationship, or resistances in series add algebraically:

$$R_T = \sum_{i=1}^{i=n} R_i \qquad \text{where } g_T = 1/R_T$$

Where R_T is low, g will be high and represent a good conductor. Yet R_T, if it is low cannot be higher than the highest value of R_i; hence the individual resistive elements must all be smaller than the total. Therefore a low resistivity measured across a bulk sample of this nature must necessarily represent the bulk resistivity unless there is a short circuit path through the sample space.

In the case of Primary Resistivity Anomaly II which consists of five bulk resistivity readings it is possible that even under anisotropic conditions smaller volume short circuit paths through the sample space could make it appear that the large volume of extremely-low resistivity is homogeneously conductive throughout the space when it is not.

Because of the volumetric distribution of current using the IP technique, when the multiple current paths encounter this type of conductive body made up of low resistive and high resistive paths through it one would expect some current distribution to flow through both the low resistive and high resistive elements and give rise to some readable chargeabilities within the high resistive elements. However this is not the case as no chargeability effect could be read from this conductive body because the entire volume of extremely-low resistivity appears to have such a low voltage drop across it, at all five (5) sampling levels, as to preclude the reading of chargeability due to electrical noise which adds some credence that this body is a large homogeneous conductor which is too big to represent a conductive shear zone and much less a conductive fault.

There is also no geological evidence of either a fault or shear zone where the long axis of this body projects to surface. There is also no electrical evidence that this extremely-low resistivity effect continues above Level 2 which is 140 metres below grade.

Whether a fault or shear, such large and strong structural elements, if they existed, would normally be expected to extend to surface.

Polycrystalline graphite is known to have a conductivity of about 5 x 10^4 mhos/metre and a small percentage of graphite in a structure will give a very noticeable low resistivity. Granitic schists can exhibit resistivity ranges between 10 and 100 ohm metres. Disseminated graphite will also exhibit a pronounced chargeability effect.

Magnetite in polycrystalline or massive form is not a good conductor, yet when present in disseminations will exhibit a low chargeabilty effect.

Table 9.2 Conductivity-Thickness Values for Primary Resistivity Anomaly II

The pseudosection, Figure 5 includes five (5) extremely low resistivity readings, 7, 7, 7, 18, & 2 ohm-metres respectively, with an average of 8.2 ohm-metres for the entire structure.

Apparent Resistivity (ohm-metres)	Conductivity mhos/metre	Width metres	Conductivity Thickness
7.0	0.14	100	4.0 mhos
7.0	0.14	50	7.0 mhos
7.0	0.14	10	1.4 mhos
8.2 (Avg)	0.14	100	12.0 mhos

Strangway (1966), completed a literature study on conductivity data from several massive sulphide deposits showing that the conductivity thickness (σs) values had a small range between 1 and 300 mhos. He also reported on a study of 17 other separate determinaion s made by N.R. Paterson in 1961 which reported σs values within the low range of 2.2 to 12.8 mhos. Strangway concluded his paper by stating that "typical values for sulphide deposits range between about 1 and 300 mhos."

σ = conductivity= 1/p (p= resistivity in ohms)
σ = conductivity - mho/metre
s = conductor thickness - metres

Paterson (1971), ranged massive sulphide conductors between 0.10 mhos/metre to 1,000 mhos per metre from his studies of geological materials found in the Canadian Shield. See **Table 9.3**.

Fraser (1974), stated that anomalies that exhibit conductivity-thickness products in excess of 10 mhos would be classified as good to excellent conductors.

Lack of a readable chargeability due to noise within the extremely-low resistivity zone does not exempt it from being a massive sulphide deposit because massive sulphides, depending upon their crystalline structure, can in many cases exhibit a much lower chargeability magnitude compared with a high concentration of well disseminated conducting sulphides. Brant (1966), p.290 concluded that "the larger the sulphide particle or aggregate, the lower is the IP response per volume percent, since the impedance of the leaky condenser-like surface charge decreases."

A massive sulphide deposit containing significant magnetite or a magnetite deposit on its own is ruled out because there is no known ground or airborne magnetic anomaly known at this specific location or in the immediate area to the north where amagnetic survey was conducted in 1990.. Also magnetite in polycrystalline or massive form is not a good conductor.

However banded magnetite deposits are known for their low conductivity-thickness ranges between 1,000 mhos down to the order of 1×10^{-4} mhos. See **Table 9.3** (after Paterson, 1971).

The geochemistry at surface across at least 200 metres above the subcropping extremely-low resistivity, high conductivity-thickness zone has the highest copper values on the property reading on average in excess of 1,100 ppm and is undoubtedly related in part to the copper bearing skarnification in outcrop along this section and in drill hole RC93-5 to the south. This large zone of skarn could be related to a postulated massive-sulphide deposit at depth.

The linear north-south strike pattern of the copper-in-soils anomaly that overlies this conductor has as previously stated a strike distance of 1,100 metres. This lineation suggests that this copper population may be distinct from the more elliptical pattern of copper in soils that is located above the altered intrusive complex to the west and could be the chemical effect from a distinctly separate mineralized body.

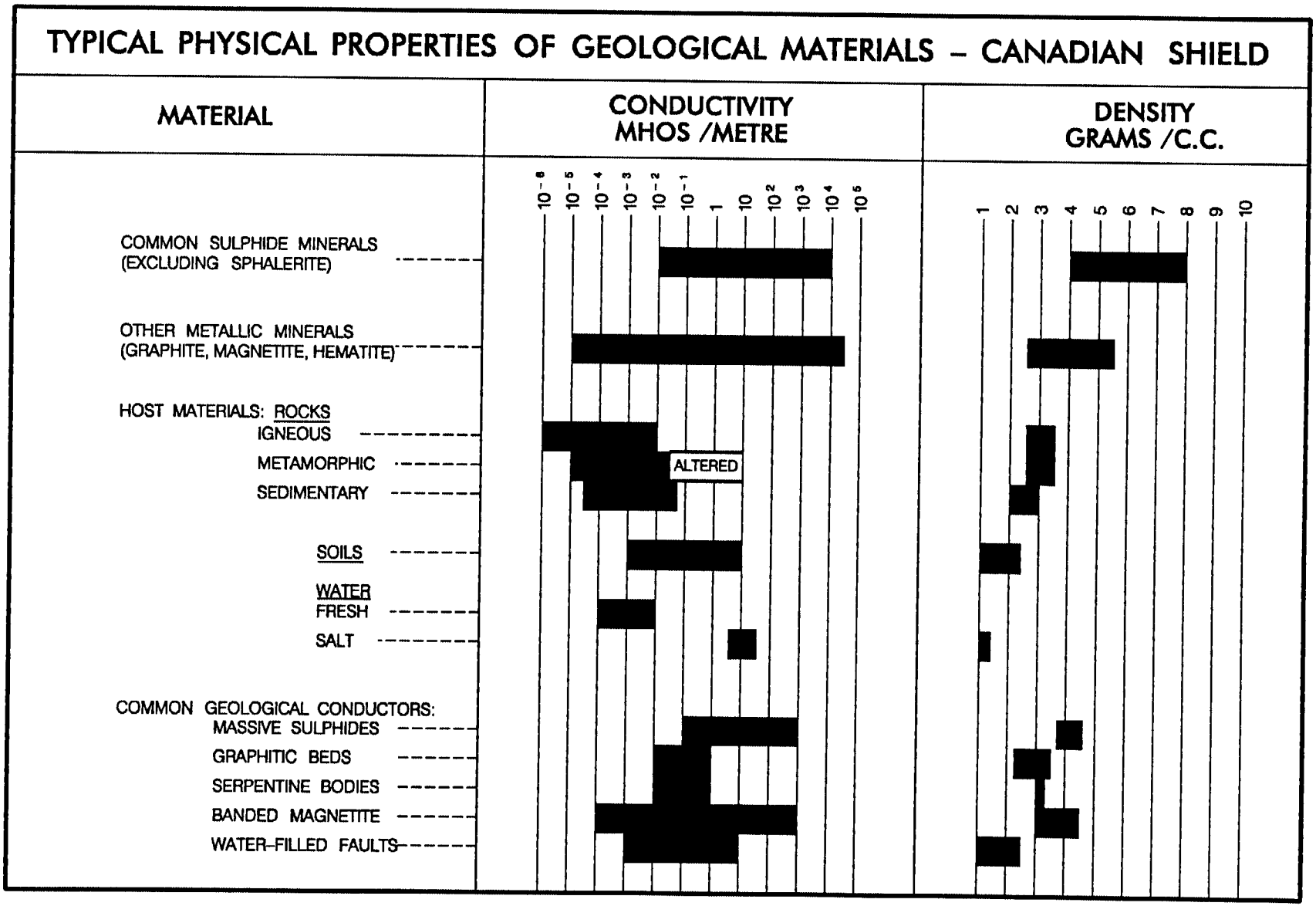


TABLE 9.3 TYPICAL PHYSICAL PROPERTIES OF GEOLOGICAL MATERIALS IN THE CANADIAN SHIELD (AFTER PATERSON, 1971).

It is unlikely that the average 12.2 mho conductivity-thickness measured for Anomaly II is caused by a water filled fault or shear structure as such structures usually exhibit conductivity thicknesses less than than 1 mho. Similarly metamorphic alteration effects may cause conductivity-thickness effects of less than 1 mho.

What is interesting about this anomaly is that it has formed along the east hanging wall section of the large chargeability anomaly within the multi-phased intrusive complex along its contact zone with the surrounding lithology. A contact metasomatic skarn deposit containing massive sulphides might ideally be found at this location.

Further support that Anomaly II could represent a copper bearing massive sulphide deposit at depth is the large area of copper-bearing-skarn along with a significant high amplitude copper-in-soils anomaly found in surface outcrop about 140 metres above the top of this buried anomaly. An attenuated self-potential anomaly of minus 50 millivolts over this zone could also be indicative of a buried massive-sulphide deposit undergoing oxidation at its near surface end.

9.8.6.3 **Self-Potential Measurements**

A self-potential (SP) response of -183 millivolts was recorded at Line 100S, Station 1600 West on the east edge of the large chargeability anomaly identified as Primary IP Anomaly I. A similar SP response was recorded at Station 2100 which apears to be the western edge of the same large chargeability anomaly. A smaller SP response of -76 millivolts is located between the two larger responses; indicating that a complex system of sulphides undergoing oxidation is occurring in the area of interest, as the large negative SP responses are consistent with oxidation potentials expected from sulphides undergoing chemical reduction-oxidation at depth.

Between Station 1200 and Station 1500 is a smaller magnitude SP response, averaging about -50 millivolts an estimated 130 metres above the extremely-low resistivity, high conductivity zone of Primary Resistivity Anomaly II. This lower level SP response could be caused by the oxidation of a massive-sulphide body at depth; attenuated by 130 metres of overlying lithology.

9.8.6.4 Negative IP Effect

There is a single small negative IP reading on line 100-South below Station 1250. The causes could be the close proximity of Chargeability Anomaly I which is centered below Station 1500.

As is also explained in 9.8.5.4 this is not inconsistent with the fact that negative IP has been observed to occur on both sides of a chargeable body, when the location of the survey line relative to the chargeable body with the chargeable body being close to the surface relative to the electrode spacing.

9.9 Recapitulation

The magnetic anomaly and VLF-EM anomalies discovered in a survey conducted in 1990 had no geochemical reference to go by other than that these anomalous features were believed to be related. The exact location of the copper-in-soils anomaly discovered in 1969 was unknown but was confirmed through a new survey conducted in 1993. However, only upon completion of this deep-probe IP survey has the most meaningful correlation been possible.

The high-chargeability anomaly discovered by a shallow-probe IP survey in 1993 which was co-incident with part of the large geochemical anomaly became the principal target area for a reverse circulation percussion drilling program. However it appears that none of the drilling within the high-chargeability anomaly was drilled within known zones of high copper values.

The assay results from the drilling indicated a very-low copper content averaging close to 600 ppm copper and were considerd disappointing. Accordingly, the property option was terminated by the operator.

However, subsequent results from the geological and petrographical studies of the drill cuttings in 1994 and 1995, respectively, indicated that intensely altered multiple episodic intrusive phases subcropped the area of the drilling and that copper mineralization in the form of disseminations and veins were found within the zone of alteration.

In addition, cursory surface mapping and drill hole geological and petrographical work recognized extensive skarnification within the host lithology consisting of limy-metavolcanics and limy-metasediments thereby confirming the possiblity of finding contact-metasomatic type massive sulphide copper deposits within the contact aureole of the intrusive complex.

The bottom fifty feet of drill hole RC93-3 was found to be of particular interest as it contained statistically significant copper values grading 0.10% copper within a stockworks zone of quartz-carbonate, pyrite-chalcopyrite veinlets. This zone was believed to be just beyond the detection limit of the shallow-probe (140 metres) IP survey.

Accordingly it was decided to conduct a deep-probe IP survey over the same area to view the electrical properties of the rocks at depth within the intrusive complex and along its contact aureole to the north, east and south.

The deep-probe IP results were most encouraging from an exploration point of view as they indicate that the chargeabilities increase significantly below the level tested in the 1993 drilling and that coincident zones of probable silicification which are believed to be the more favourable mineral host horizons have been virtually untested. Additionally those zones of high copper geochemistry on surface which were also never tested appear to coincide with the surface projections underlying zones of silicification.

The contact aureole also held some surprises, particularly the discovery a nominal 12.2 mho conductivity-thickness anomaly along the east contact zone. This possible massive sulphide zone may explain a very high copper content geochemical anomaly at surface with a north-south strike for a distance of at least 1.1 km, relatively undiminished in strength, that coincides at Line 5000N with a two-station VLF-EM anomaly discovered in 1990.

A similar low conductivity-thickness anomaly, IP Anomaly III, subcrops the contact area to the north and it too has a significant but much broader co-incident VLF-EM anomaly at surface.

All geophysical features appear to include significant Self-Potential anomalies which indicates that sulphide bodies at depth are actively undergoing chemical oxidation-reduction processes.

SECTION 10.0 — EXPLORATION POTENTIAL

Monger (1997) speculates that the Mount Lytton Complex and the Guichon Batholith were formed from the same subducted section of Oceanic Crust with the Guichon Batholith, a differentiate from the upper part of the upper plate of subducted crust and the Mount Lytton Complex representing the lower part of the upper plate. This leads to the interesting speculation that this intrusive event could have concentrated copper minerals from a copper-enriched crustal element in a similar fashion, as it stoped its way up towards the surface.

According to Meinert (1993), and he put it succinctly with the following abstract quoted from his paper "Igneous Petrogenesis and Skarn Deposits":

Abstract

"Skarns are characterized by their mineralogy and can be host to a variety of mineralization and alteration styles. Skarn mineralogy is mappable in the field and serves as the broader "alteration envelope" around potential orebodies. Systematic mineralogical variations among skarn classes provide a predictive method for evaluating prospects. As a class, skarn deposits serve as one of the clearest examples of ore deposits directly related to emplacement, crystallization and hydrothermal evolution of magmatic systems. The petrogenesis and tectonic setting of skarn deposits are important parts of any exploration model. Major-element composition, degree of crystallization, depth of emplacement, timing of fluid separation, and oxidation state of plutons all appear to correlate with the metal content of associated skarns and certain tectonic settings. A model is presented to explain differences in size and metal content of different skarn tupes as a function of igneous petrogenesis. In some cases, correlations between skarns and igneous processes provide links to other deposit types (e.g. porphyry deposits, high temperature, carbonate hosted sulphide replacement deposits) that may not contain skarn."

Meinert stated [the quotation marked paragraphs that follow are excerpts from Meinerts paper; author] "there appears to be a distinct class of plutons associated with copper skarns, particularly copper skarns associated with porphyry copper deposits. These are strongly oxidized magnetite-bearing I-type plutons associated with subduction-related magmatic arcs."

I-type plutons vary from true granite to plutons that are gabbroic in composition.
"Horneblende is the dominant hydrous mineral in most I-type plutons and biotite is the main hydrous mineral in most S-type plutons. Horneblende typically contains 1-2 wt.-% H_2O and $Na_2O > K_2O$."

According to Meinert, "The solubility relations of water in silicate melts and the probability of rapid shifts from lithostatic pressure to hydrostatic pressure in the near-surface environment make it extremely likely that shallowly emplaced magmas will generate large amounts of hydrothermal fluids prior to complete crystallization. This explains the abundance of large skarn deposits in shallow settings."

"Such plutons are emplaced at shallow levels in the Earth's crust and tend to be porphyritic, implying fluid separation before the magma had crystallized to a high degree."

"The large size of copper skarns formed this way may be due to separation of a hydrothermal fluid before loss of water, sulphur and ore metals to continued crystallization.

According to Gale (1993) and Reid (1994) the plutonic rocks at Ashton Copper include a range of episodic hypabyssal quartz diorite; including horneblende diorite and horneblendite; diorite porphyry; and gabbro including pyroxene gabbro and pyroxenite. These rocks contain significant disseminated magnetite much of which has undergone oxidation to hematite.

Although a formal confirmation that these rocks belong to the I-type plutonic class has yet to be made, the intrusive style appears to fit Meinerts thesis.

Reid (1990) also described the area of alteration "as having experienced the passage of large quantities of hydrothermal fluids, containing significant volatiles, through the host rocks" whereas Meinert states that "of particular importance to skarn formation are the segregation and release of an aqueous phase from the crystallizing melt". What Reid may have observed are the effects of this aqueous phase as there is very little copper metal associated with the alteration and upper sections of the drill holes. Hence this effect observed by Reid may be reminiscent of the effect of hydrothermal fluid loss reported by Meinert, due to partitioning of the aqueous phase from the metal-rich phase, before complete crystallization of the metal-rich phase.

The geology at Ashton Copper possesses several similarities to Meinerts model hence a large-tonnage massive sulphide skarn-type copper deposit could be a possibility having formed within the carbonate rich rocks of the meta-sediments within the aureole of the intrusive complex.

The region has hosted several significant copper deposit types including Craigmont, Afton, and Valley Copper (with the Lornex deposit included as part of the larger mining and milling operation). The following describes some of the significant IP data related to these orebodies.

The Craigmont Mine

The Craigmont copper-skarn deposit (now mined out) which formed along the south margin of the Guichon Creek Batholith contained more than 40 million tons of 1.9% copper ore.

Only after the discovery of the Craigmont massive-sulphide copper orebody was a time-domain IP survey conducted over the orebody. Two "a" spacings were used, 100 feet and 200 feet. A chargeability maximum of 7.0 ms with a corresponding 20 ohm-metres low-resistivity minimum was recorded for the 100 foot "a" spacing and an offset 5.9 ms chargeability maximum with a 30 ohm-metre low-resistivity minimum was recorded for the 200 foot "a" spacing.

The Afton Mine

The diorites, gabbros and other basic intrusive rocks found in the drilling could also be indicative of an Afton Style mineralizing event. Afton contained 30 million tonnes of ore at an average of grade of 1.0% copper and 0.015 ounces of gold and is now mined out.

At Afton, Carr et al (1976), the orebody was found within the 2-5% sulphides zone at its boundary where the sulphide content increased to 5-10% as determined by the IP frequency-effect. A small tongue of anomalous 5-10% sulphides bisected the orebody.

Lornex & Valley Copper

The giant world-class Valley Copper Mine is located 23 miles (37 km) northeasterly from the Ashton Copper Prospect. It is an integrated operation that consists of the former Lornex orebody and the Valley Copper orebody. This mine produces an estimated 1.4 million pounds of copper in concentrate daily; when operating.

This operation is made up integrally of two orebodies which are the faulted off sections of the same original copper deposit.

Van Blaricom p.81,90 shows how the economic-grade copper zone at Lornex was discovered by an IP survey using an 800 foot (244 metre) "a" spacing. Previously drilling of an IP survey using an "a" spacing of 200 feet (60 metres) resulted in the discovery of pyrite with only small amounts of copper. The chargeability contrast between "economic" grade copper sulphides measured at an average of 11.3 ms and non-ore grade sulphides at an average chargeability response of 7.8 ms, was only 3.5 ms.

Resistivities over the ore zone averaged in the neighborhood of 300 ohm-metres and increased to an average of about 400 ohm metres in the surrounding low grade copper-pyrite zone.

Osatenko (1976), p.136 shows the relationship between quartz veinlet stockworks and silicic alteration with the main ore zone of Valley Copper. The 10 percent secondary quartz isogon outlines the bornite/chalcopyrite orebody; and in areas greater than 0.50% copper secondary quartz ranges up to about 20 percent. Bornite is the most abundant copper mineral in the deposit with the bornite/chalcopyrite ratio being the highest in the central silicified section of the deposit.

A similar paper on the Lornex copper deposit to that of Osatenko's on Valley Copper makes no mention of the secondary quartz alteration at Lornex however because they are both part of the same original copper deposit we surmise that there may also be secondary quartz alteration at Lornex in which case we would expect to see higher resistivity zones associated with the orebodies of both deposits.

SECTION 11.0 — COST STATEMENT

11.1 Summary

1.	Personnel	14,390.00
2.	IP Equipment Rental	1,050.00
3.	Equipment & Field Expense	1,010.08
4.	Room & Board	1,050.00
4.	Assay Cost	75.22
5.	Travel Expense	275.00
6.	CAD Processing & Report Reproduction	375.80
	TOTAL	**$ 18,226.10**

11.2 Personnel

1.	Project Evaluation & Review of Data; 3 May 1999 J.M. Ashton, P.Eng. 1 day @ $500.00	500.00
2.	Property Examination, 4 May, 1999 D.G. Mark, P.Geo., Geophysicist V. Austria, M.Sc., F.G.A.C., Geologist J.M. Ashton, P.Eng.	1,100.00
3.	Trip Preparation & Travel to Lytton Base from Vancouver; & Return: 26 June & 30 June, 1999 D. Mark, P.Geo. R. Grummisch W. Markham Stephen Hodges Scott Hodges: 14 Hours @ $140.00 per hour -	1,960.00

4.	Travel to Lytton Base from Vancouver & Return: 27 June & 1 July, 1999 J.M. Ashton, P.Eng. 10 Hours @ $60.00 per hour -	600.00
5.	IP Survey, 29th & 30th of June, 1999 J.M. Ashton, P.Eng. D.G. Mark, P.Geo. R. Grummisch W. Markham Stephen Hodges Scott Hodges: 22 hours @ $200.00 per hour -	4,400.00
6.	Data Preparation D.G. Mark, P.Geo. 6 hours @ $60.00	360.00
7.	Report Preparation July/August 1999 J.M. Ashton, P.Eng. 6 days @ $500 per day -	3,000.00
8.	CAD Drawing Preparation E.B. Catapia, C.Tech 27 hours @ $50.00	1,350.00
9.	Word Processing, Collation and Drawing Reproduction S. Apchkrum: 24 hours @ $35.00 -	840.00
10.	Report Review D. Mark, P.Geo	300.00

11.3 Induced-Polarization Equipment Rental

1. One Honda 4.0 kW, Engine Generator
2. One BRGM Model VIP 4000, IP Transmitter
3. One BRGM Model ELREC 6, IP Receiver
4. Cable, Electrodes, Conductor, etc.

3 days @ $350.00 per day - 1,050.00

11.4 Field Expense, 4 May 1999, Property Examination

1. Vehicle Rental & Gasoline - 162.83
2. Meals - 147.25

11.5 Equipment Expense, 27th of June to 30th June

1. Truck Rental @ $650.00
2. Survey Supplies @ $50.00 700.00

11.6 Room & Board

6 men, 3.0 days @ $350.00 per day - 1,050.00

11.7 Travel Cost, J.M. Ashton, P.Eng.

1. Mileage, 500 km @ $0.35/km - 275.00

11.8 Assay Cost

1. 3 samples, 30 Element ICP,
   Au, Pt, Pd Fire Assay &
   Sample Preparation 75.22

11.9 CAD Processing & Report Reproduction

1. CAD Processing
   & Report & Drawing Reproduction 375.80

SECTION 12.0 — CERTIFICATION OF J.M. ASHTON, P.Eng.

I, J.M. Ashton, of Suite 728, 602 West Hastings Street, Vancouver, British Columbia, hereby certify that:

1. I am a Consulting Electrical Engineer and principal in J.M. Ashton & Associates Ltd., Consulting Electrical Engineers. I am also the principal in the Company, 808 Exploration Services Ltd. which provides professional services in mineral exploration.

2. I am a graduate of the University of British Columbia with a B.A.Sc. in Electrical Engineering (1966).

3. I am a member in good standing, as a Professional Engineer, in the Association of Professional Engineers and Geoscientists of the Province of British Columbia.

4. I am a member of the Canadian Institute of Mining and Metallurgy.

5. I have practised as a mineral explorationist, with significant work related to geophysics; and as consulting electrical engineer, since 1969.

6. This report was prepared by me.

J.M. Ashton, P.Eng.

Dated this 31st day of August 1999
Vancouver, British Columbia

SECTION 13.0 — CERTIFICATION OF D.G. MARK, P.Geo.

I, David G. Mark, of the City of Surrey, in the Province of British Columbia, do hereby certify:

1. I am a consulting Geophysicist and principal of Geotronics Surveys Ltd., with offices located at 6204 - 125th Street, Surrey, British Columbia.

2. I am a graduate of the University of British Columbia with a Bachelor of Science in Geophysics (1968).

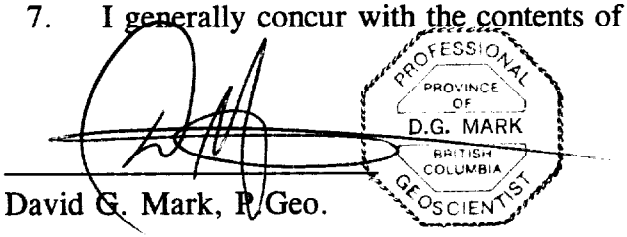
3. I am a member in good standing, as a Professional Geoscientist, in the Association of Professional Engineers and Geoscientists of British Columbia.

4. I have been practising my profession for the past 31 years and have been active in the mining industry for the past 25 years.

5. The field work and data processing for the induced polarization survey described in this report was carried out by myself as Party Chief and Receiver Operator with equipment supplied by Geotronics Surveys Ltd.

6. I provided data preparation services and technical consulting services to J.M. Ashton, P.Eng., pursuant to the preparation of this report.

7. I generally concur with the contents of this report.



David G. Mark, P.Geo.

Dated this 31st day of August, 1999.
Vancouver, British Columbia

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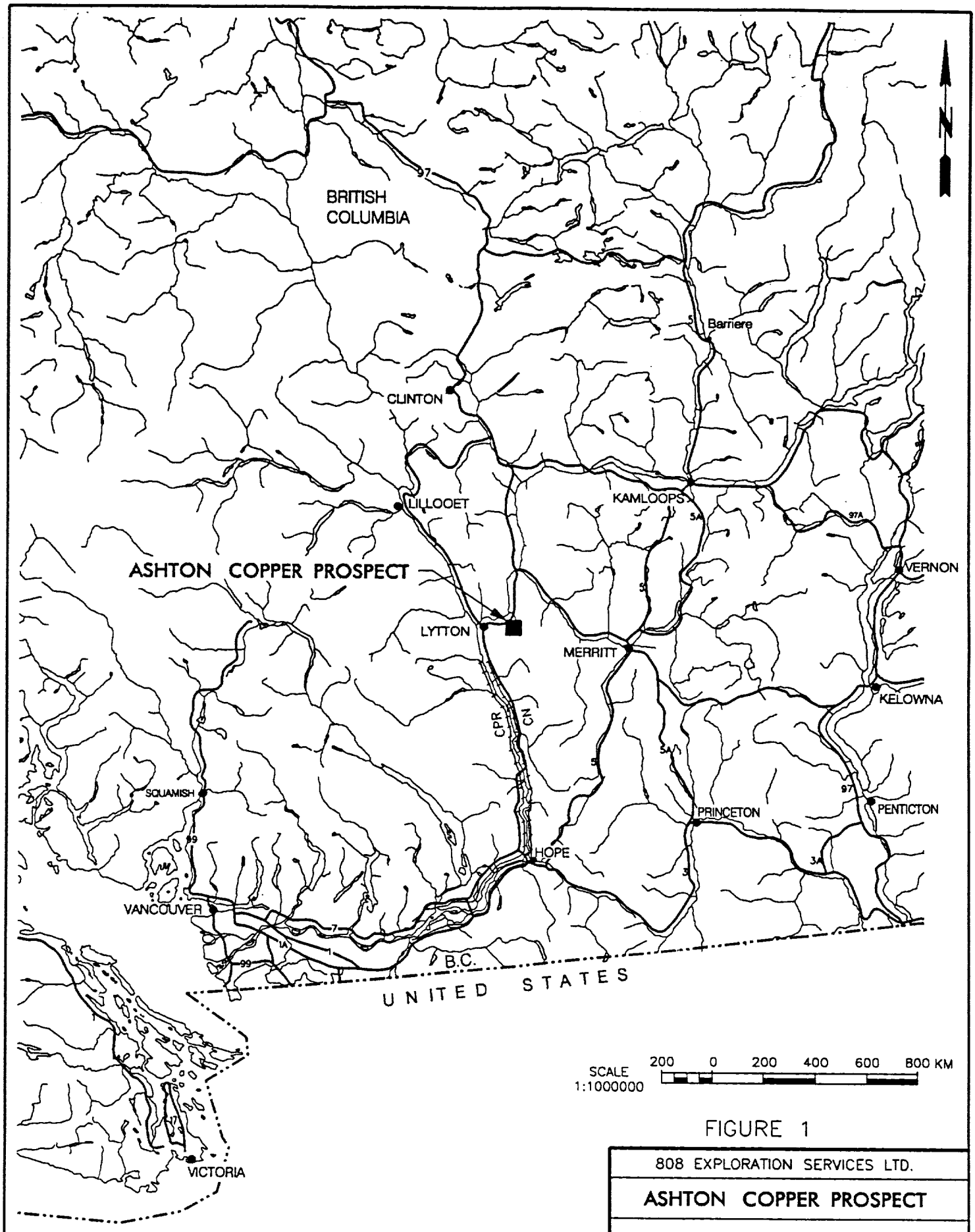


FIGURE 1

808 EXPLORATION SERVICES LTD.		
ASHTON COPPER PROSPECT		
GENERAL LOCATION MAP		
DRAWN : EBC	CHKD : JMA	DATE : JULY 1999

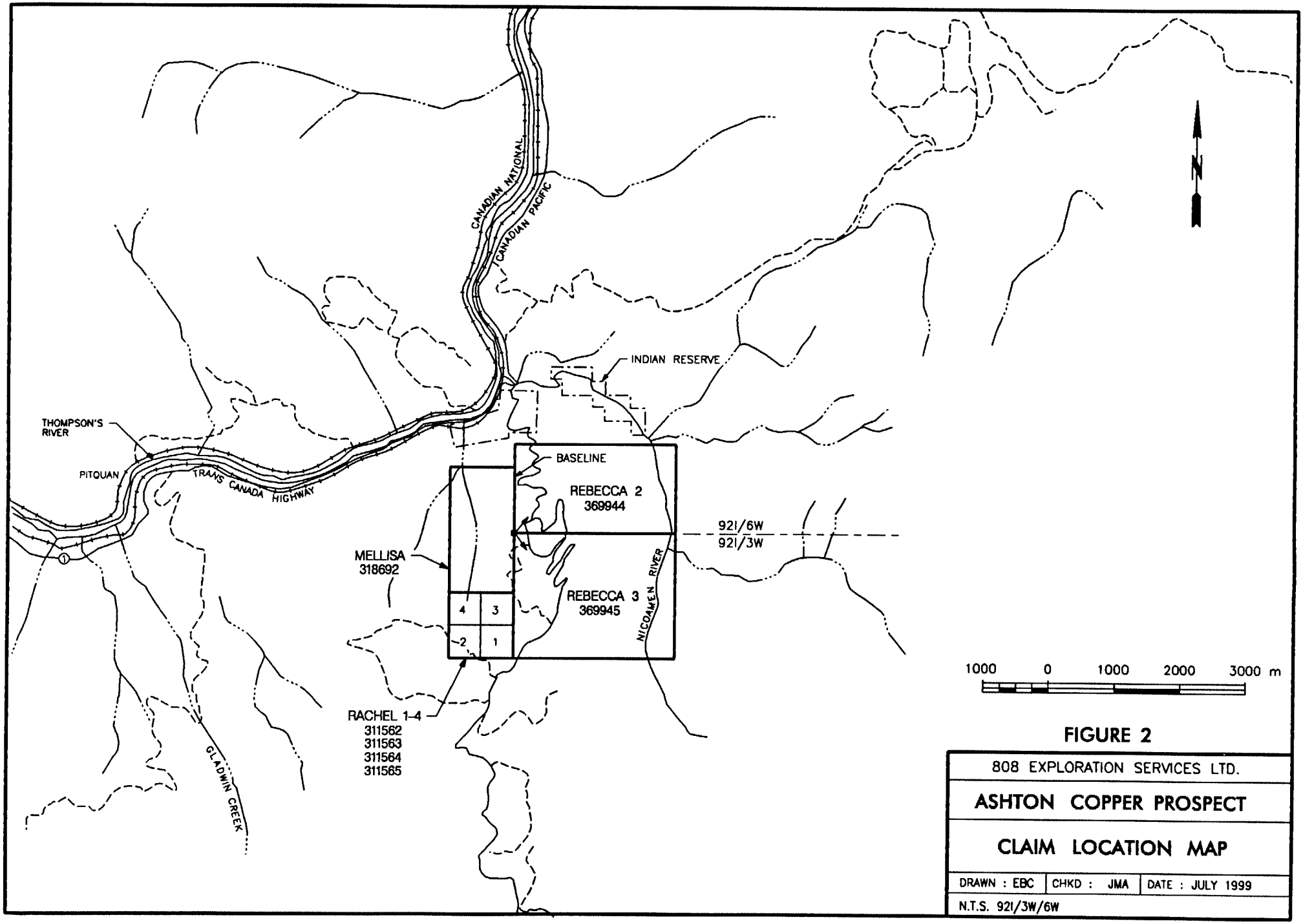
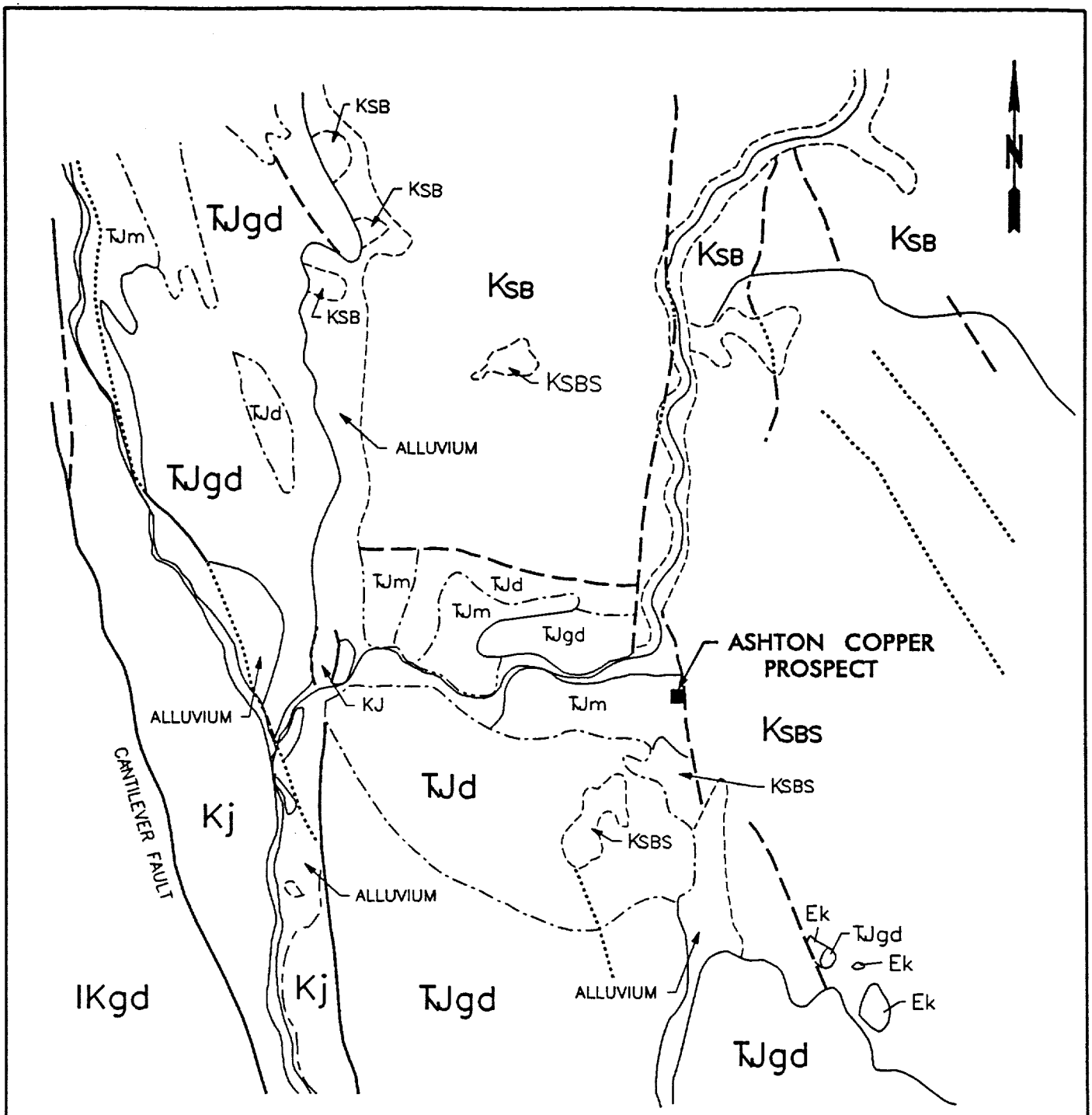


FIGURE 2

808 EXPLORATION SERVICES LTD.
ASHTON COPPER PROSPECT
CLAIM LOCATION MAP
DRAWN : EBC | CHKD : JMA | DATE : JULY 1999
N.T.S. 92I/3W/6W



LEGEND

FAULT

INFERRED FAULT

LATE CRETACEOUS

lKgd –GRANODIORITE,QUARTZ MONZONITE

SPENCES BRIDGE GROUP

KsB –FELSIC, MAFIC FLOWS AND SANDSTONE –SHALE

KsBs –MAFIC VOLCANICS –CONGLOMERATE

EARLY AND MIDDLE CRETACEOUS

JACKASS MOUNTAIN GROUP

KJ SANDSTONE, ARGILLITE, CONGLOMERATE

TRIASSIC AND/OR JURASSIC

TJd –DIORITE, AMPHIBOLITE MT. LYTTON COMPLEX

TJgd –GRANODIORITE, QUARTZ MONZONITE MT. LYTTON BATHOLITH

TJm –LAYERED QF ROCK, AMPHIBOLITE, MYLONITE MT. LYTTON BATHOLITH

SCALE 1:200000

4 0 4 8 km

FIGURE 3

808 EXPLORATION SERVICES LTD.

ASHTON COPPER PROSPECT

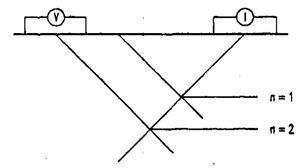
REGIONAL GEOLOGY

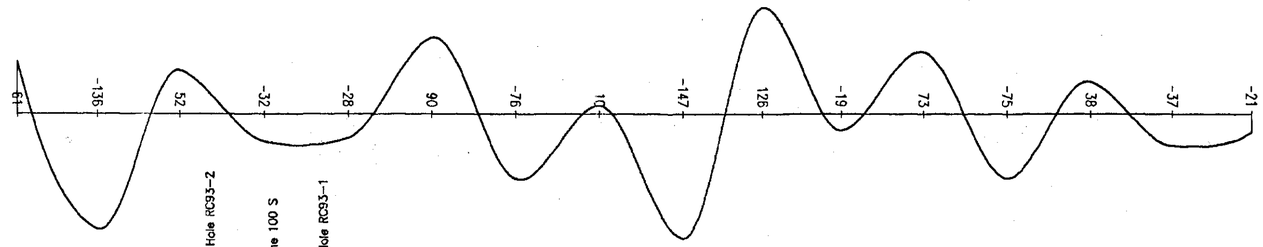
DRAWN : EBC	CHKD : JMA	DATE : JULY 1999

MODIFIED AFTER J.W.H.MONGER GSC MAP 42–1989

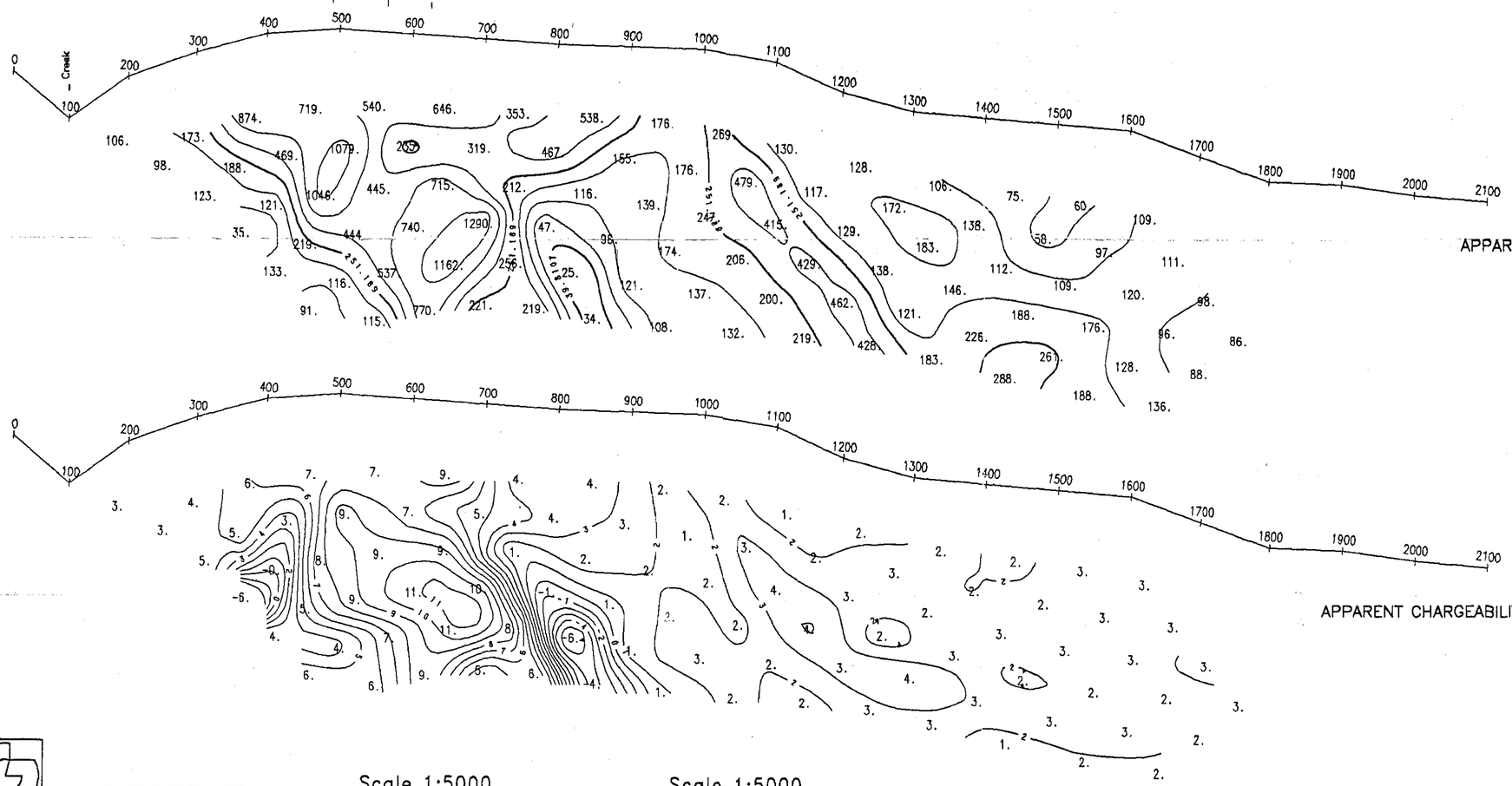
Survey Direction: North

Pseudosection Plotting Method





SELF POTENTIAL (SP)



APPARENT RESISTIVITY

APPARENT CHARGEABILITY (IP)

LEGEND

CONTOUR INTERVALS

Resistivity :	log base 10 ohm-metres
Chargeability:	1 millisecond

INSTRUMENTATION

Receiver:	BRGM IP-6
Transmitter :	BRGM VIP 4000
Generator:	6.5 kWatt Honda

IP SURVEY PARAMETERS

Survey Mode:	Time Domain
Array:	Dipole-Dipole
Dipole Length:	100 meters (330 feet)
Dipole separation:	n=1 to n=6
Delay Time:	240 milliseconds
Integration Time:	1600 milliseconds
Charge Cycle:	8 second square wave

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

26,007

Geotronics

GEOTRONICS SURVEYS LTD.
VANCOUVER BC.

Scale 1:5000
100 0 100 200
(metres)

Scale 1:5000
250 0 250 500 750
(feet)

Survey date: JUNE 1999

GEOTRONICS SURVEYS LTD.

808 EXPLORATION SERVICES LTD.

ASHTON COPPER PROSPECT

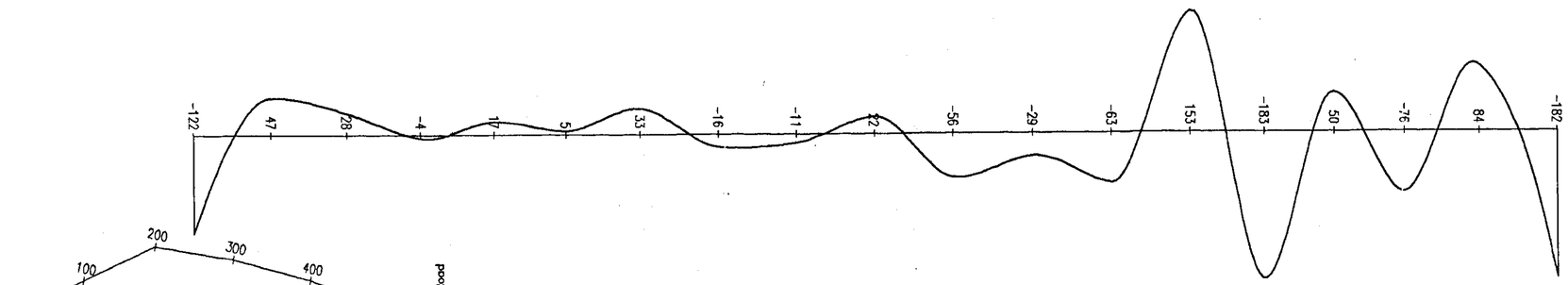
Nicoamen River, Lytton Area
Kamloops Mining Division, B C

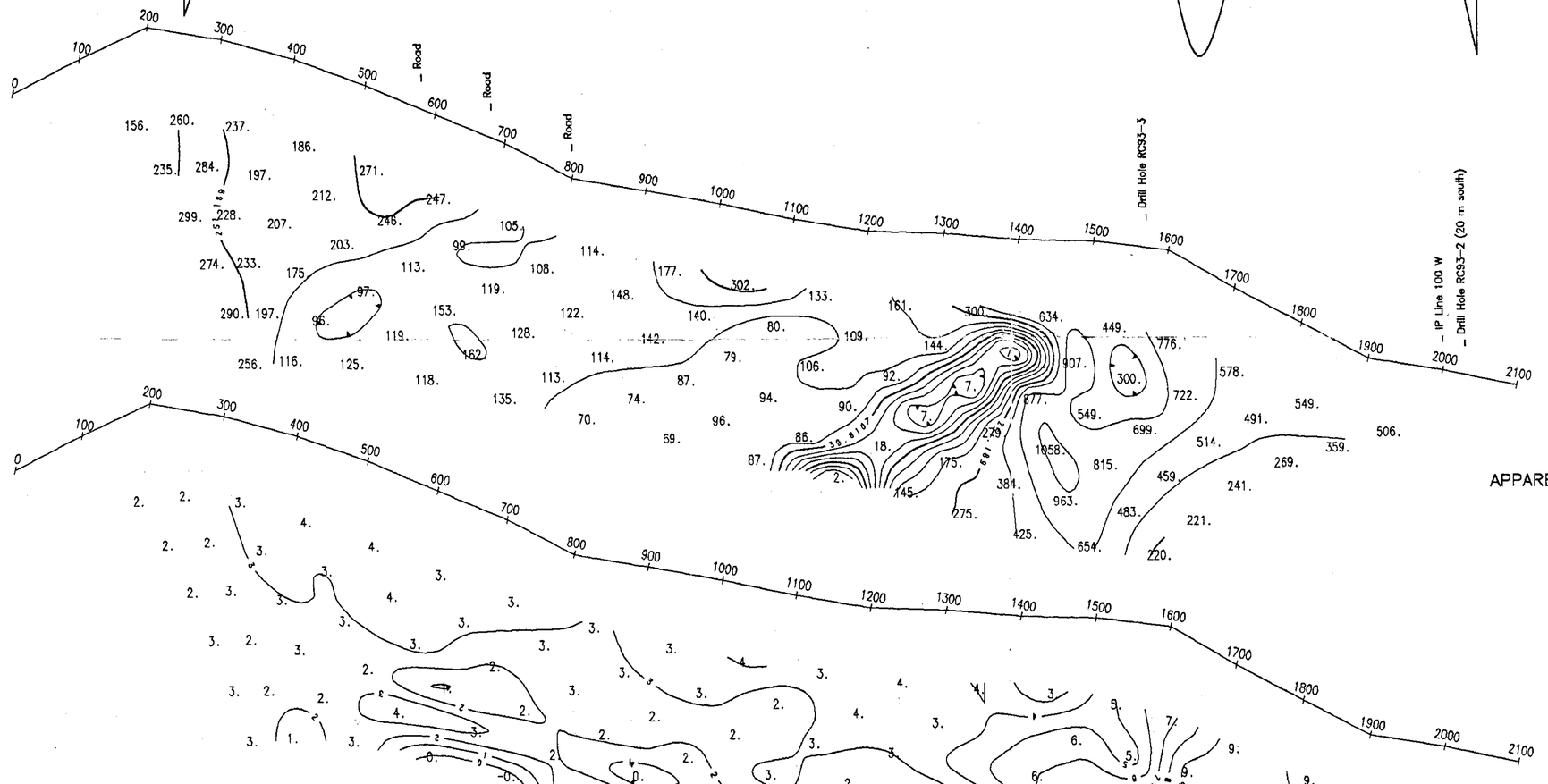
IP & RESISTIVITY PSEUDOSECTIONS
WITH SELF POTENTIAL PROFILE

LINE 100W

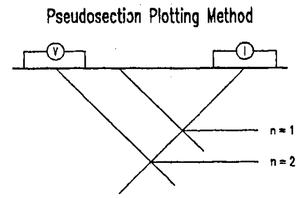
Drawn by:	Job No.	NTS	Date	Fig No.
DGM	99-03	92I/3W,6W	June 99	4

Survey Direction: West





Pseudosection Plotting Method



LEGEND

CONTOUR INTERVALS

Resistivity :	log base 10 ohm-metres
Chargeability:	1 millisecond

INSTRUMENTATION

Receiver:	BRGM IP-6
Transmitter :	BRGM VIP 4000
Generator:	6.5 kWatt Honda

IP SURVEY PARAMETERS

Survey Mode:	Time Domain
Array:	Dipole-Dipole
Dipole Length:	100 meters (330 feet)
Dipole separation:	n=1 to n=6
Delay Time:	240 milliseconds
Integration Time:	1600 milliseconds
Charge Cycle:	8 second square wave

GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

26,007

Geotronics

GEOTRONICS SURVEYS LTD.
VANCOUVER BC.

Scale 1:5000
100 0 100 200
(metres)

Scale 1:5000
250 0 250 500 750
(feet)

Survey date: JUNE 1999

GEOTRONICS SURVEYS LTD.

808 EXPLORATION SERVICES LTD.

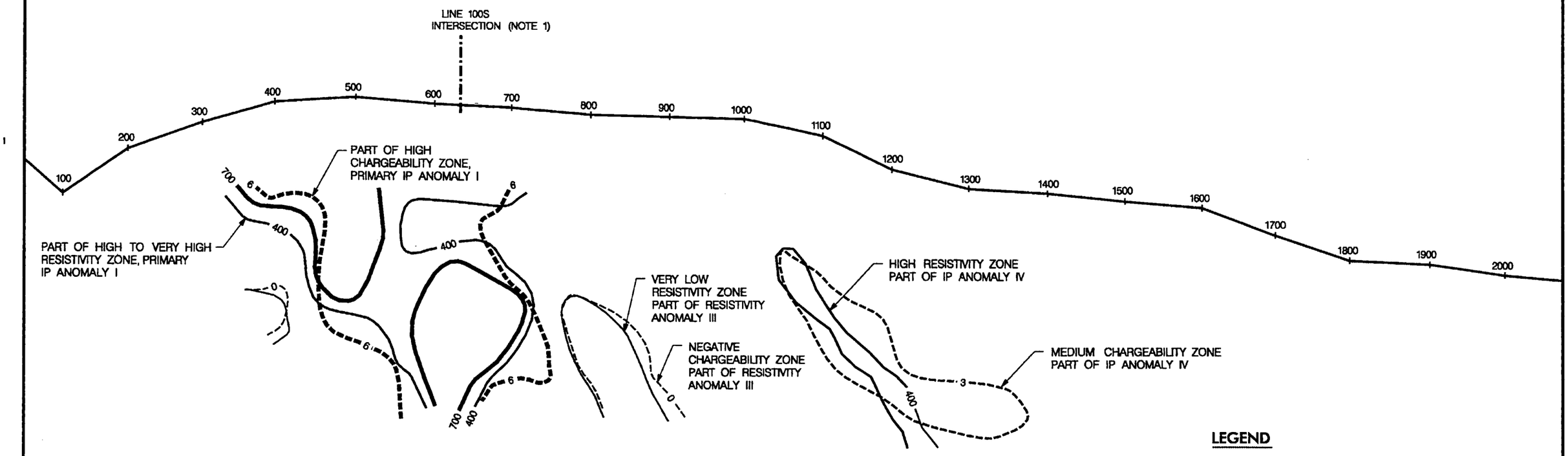
ASHTON COPPER PROSPECT

Nicoamen River, Lytton Area
Kamloops Mining Division, B C

IP & RESISTIVITY PSEUDOSECTIONS
WITH SELF POTENTIAL PROFILE

LINE 100S

Drawn by:	Job No.	NTS	Date	Fig No.
DGM	99-03	92I/3W,6W	June 99	5



SOUTH – NORTH SECTION

(AZIMUTH ~ 30°)

LEGEND

- - - - - - -	3	MEDIUM CHARGEABILITY >3 mS
▬ ▬ ▬ ▬ ▬	6	HIGH CHARGEABILITY >6 mS
———	400	HIGH RESISTIVITY >400 ohm-metre
▬▬▬	700	HIGH RESISTIVITY >700 ohm-metre

NOTES

1. SEE FIGURE 7 FOR IP ANOMALY I, LINE 100S EAST-WEST SECTIONAL VIEW.

SCALE 1:5000

50 0 50 100 150 200 250 metres

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA J. M. ASHTON 96

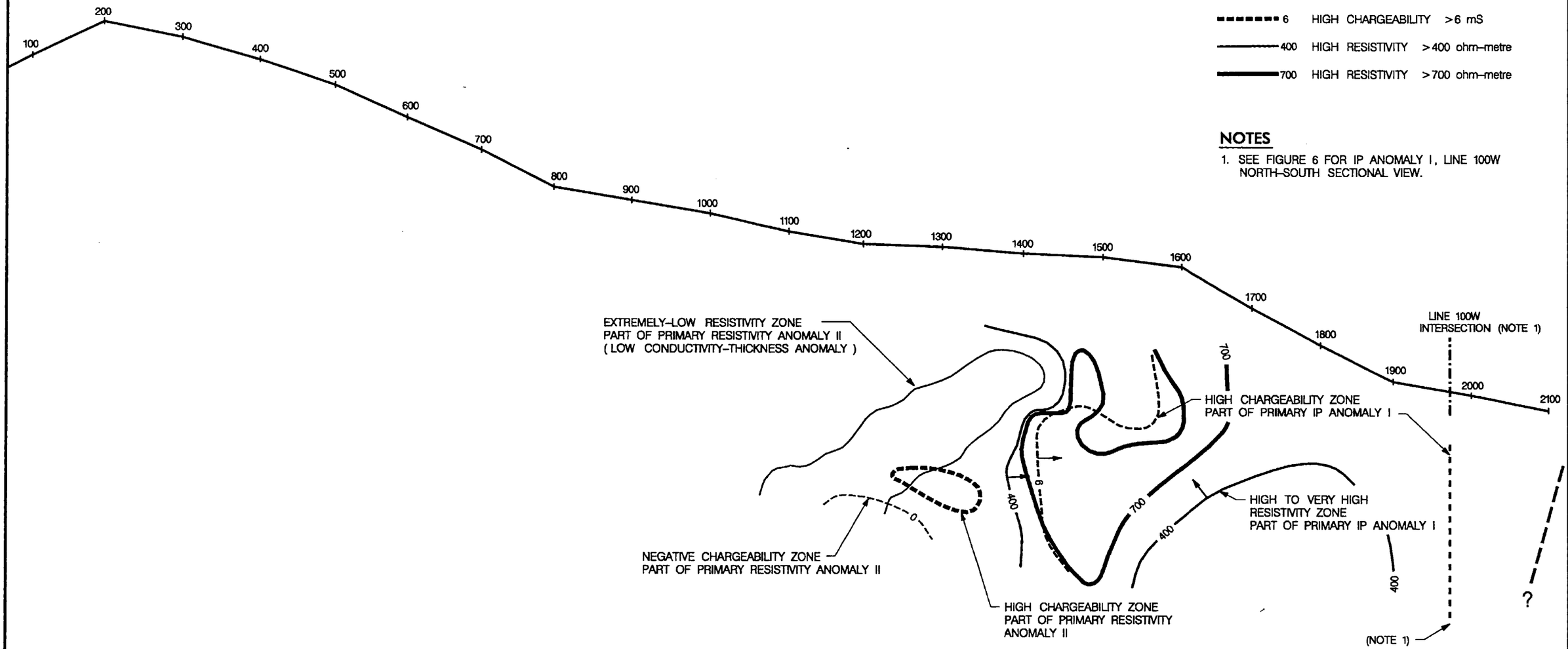
FIGURE 6

808 EXPLORATION SERVICES LTD.

ASHTON COPPER PROSPECT

ANOMALOUS CHARGEABILITY & RESISTIVITY ZONES
LINE 100 WEST (100W)

ENGINEER	JMA	SCALE	AS SHOWN
DRAWN	EBC	DATE	JULY 1999
CHECKED	JMA	REVISED	



EAST – WEST SECTION
(AZIMUTH ~ 290°)

SCALE 1:5000

50 0 50 100 150 200 250 metres

FIGURE 7

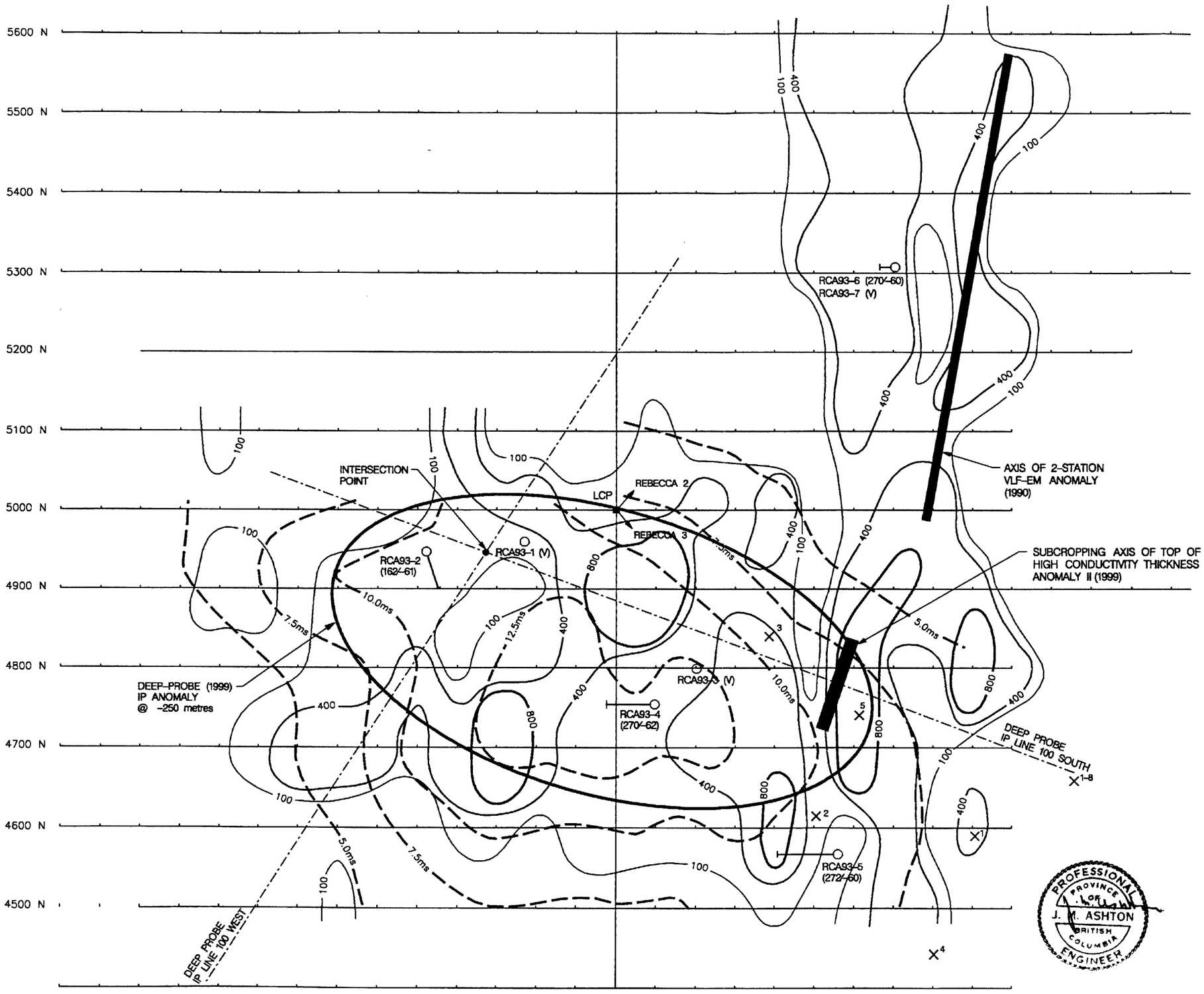
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. M. ASHTON

808 EXPLORATION SERVICES LTD.

ASHTON COPPER PROSPECT

ANOMALOUS CHARGEABILITY & RESISTIVITY ZONES
OF IP ANOMALIES I & II
LINE 100 SOUTH (100S)

ENGINEER	JMA	SCALE	AS SHOWN
DRAWN	EBC	DATE	JULY 1999
CHECKED	JMA	REVISED	



LEGEND

- 400 — GEOCHEMICAL CONTOURS, 400 ppm
- 1993 IP SURVEY, CHARGEABILITY @ -140 metres BELOW GRADE
- 1999 IP SURVEY HIGH CHARGEABILITY HIGH RESISTIVITY ZONE @ -250 metres BELOW GRADE (PROBABLE, EXTRAPOLATED FROM 2-LINE DEEP-PROBE DATA)
- 1990 VLF-EM ANOMALY AXIS
- 1999 HIGH CONDUCTIVITY-THICKNESS ANOMALY
- RCA93-5 (272/-60) — PERCUSSION DRILL HOLE (DIP, AZIMUTH)
- (V) — VERTICAL

		Cu ppm /Au ppb /Ag ppm
X1	SR93-1	3,200 /- /1.5
X2	SR93-2	1,000 /30 /1.3
X3	SR93-3	400 /60 /0.8
X4	SR93-4	700 /- /0.6
X5	SR93-5	7,800 /- /1.3
X6	SR93-6	3,293 /NA /0.4
X7	SR93-7	3,200 /NA /-
X8	SR93-8	644 /NA /-

- < 10ppb Au
- < 0.2ppm Ag
- NA NOT ASSAYED

X1-8	RC1-1	SKARN	607 /10 /-
	RC1-2		1605 /5 /0.2
	RC1-3		1760 /5 /0.2
	RC1-4		4791 /10 /0.6
	RC1-5		5767 /20 /0.6
	RC1-6		5569 /25 /0.8
	RC1-7		1595 /30 /-
	RC1-8		1180 /20 /-

NOTE:
ALL COPPER ASSAYS FROM 1 metre INTERVAL AT LOCATION SHOWN.

SCALE 1:5,000 — 50 0 50 100 150 200 METRES

FIGURE 8

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — J. M. ASHTON

808 EXPLORATION SERVICES LTD.

ASHTON COPPER PROJECT

ANOMALIES COMPILATION MAP

ENGINEER	JMA	SCALE	AS SHOWN
DRAWN	EBC	DATE	JULY 1999
CHECKED	JMA	REVISED	

APPENDIX I

Assays from Grab Samples of Reject Drillhole Cuttings from 1993 Reverse Circulation Drilling

Ashton Copper Prospect

Notes to Appendix I

On the May 4th property visit grab samples of drill cuttings from the 1993 reverse circulation drilling program were gathered from the reject piles at drill holes RC93-1, RC93-3 and RC93-5 for the purpose of performing a bulk assay specifically for the elements gold, platinum, palladium, and gallium because no assessment was ever made previously for these elements in the drill hole assays.

The basic nature of the intrusives within the intrusive complex suggests the possibility that the platinum and palladium metals might be present.

The assay results, in this Appendix I showed no bulk anomalous values of either platinum or palladium or of gold and gallium. The only anomalous element present was copper which averaged 325 ppm from the three grab samples.

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
(ISO 9002 Accredited Co.)

GEOCHEMICAL ANALYSIS CERTIFICATE

J.M. Ashton & Associates Ltd. File # 9901640
Box 22, 728 - 602 W. Hast, Vancouver BC V6B 1P2 Submitted by: J.M. ASHTON

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Ga ppm	Au** ppb	Pt** ppb	Pd** ppb
DRILLHOLE93-1	<1	383	<3	63	<.3	26	23	533	6.45	6	<5	<2	<2	142	1.8	2	<2	388	3.07	.031	6	38	1.36	28	.21	10	2.95	.14	.05	<2	14	3	2	3
DRILLHOLE3	<1	198	<3	59	<.3	16	23	500	6.64	5	<5	<2	<2	126	3.4	1	<2	409	2.66	.012	6	9	1.40	24	.14	6	2.72	.29	.03	<2	15	2	<1	<1
DRILLHOLE5	<1	395	<3	62	<.3	21	34	620	7.24	15	<5	<2	<2	78	3.1	1	<2	414	4.22	.023	6	6	1.46	16	.12	<3	1.80	.06	.04	<2	13	1	<1	1
RE DRILLHOLE5	<1	360	<3	60	<.3	20	35	569	7.27	16	<5	<2	<2	69	2.7	2	<2	414	3.90	.022	6	6	1.34	16	.11	<3	1.64	.05	.03	<2	13	5	<1	<1
STANDARD C3/FA100	25	58	32	161	5.1	34	11	744	4.10	59	20	2	19	32	24.0	18	22	80	1.01	.097	19	170	.56	158	.08	21	1.79	.04	.19	12	10	50	53	50

ICP - .500 GRAM SAMPLE IS DIGESTED WITH 3ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR AND IS DILUTED TO 10 ML WITH WATER.
THIS LEACH IS PARTIAL FOR MN FE SR CA P LA CR MG BA TI B W AND LIMITED FOR MASSIVE SULFIDE AND LIMITED FOR NA K AND AL.
ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB
- SAMPLE TYPE: ROCK CHIP AU** PT** PD** BY FIRE ASSAY & ANALYSIS BY ULTRA/ICP. (30 gm)
Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

DATE RECEIVED: JUN 7 1999 **DATE REPORT MAILED:** June 17/99 **SIGNED BY** ..... D. TOYE, C.LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

All results are considered the confidential property of the client. Acme assumes the liabilities for actual cost of the analysis only.

Data ✓ FA ___