1243

GEOLOGICAL, GEOCHEMICAL, and GEOPHYSICAL REPORTS

ON EXPLORATION OF THE

NICKEL RIDGE PROPERTY

(OLD NICK OPTION)

BRIDESVILLE, B. C.

49° 02' N - 119° 07' W -- N.T.S. 82 E-3 ~~W~~ E

By: J. A. Coope

W. M. Dolan

C. P. Costin

Work Performed: November 1967 - March 1968

Claims Held By: Nickel Ridge Mines Ltd. (N.P.L.)

May 7, 1968.

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ACCOMPANYING MAPS

INTRODUCTION

This report contains a complete summary of exploration work carried out by Newmont Mining Corporation of Canada Limited, on claims owned by Nickel Ridge Mines Ltd. (N.P.L.) near Bridesville, B. C. The claims are located within the National Topographic Reference section 82 E3 - E and the cartographic reference is approximately 49° 02' N and 119° 07' W. (Fig. 1)

PROPERTY

The Nickel Ridge property consists of 272 mineral claims and 2 mineral leases (Fig. 2) and has evolved as follows:-

(1) On April 20, 1966, Utica Mines Ltd. (N.P.L.) optioned claims Old Nick 1 - 4 from Brian Fenwick-Wilson.

Old Nick 1 - 4	4 claims

(2) Following execution of the Fenwick-Wilson option, Utica Mines staked the following claims.

Old Nick 5 - 28; 36 - 45; 60 - 87; 100 - 129; 151 - 162; 175 - 190. Old Nick A - R Old Nick X 104 - X 141 Old Nick E 1 - E 6 Old Nick Frs. 1 - 3; 10 and 11 MB 1 - 8; 20 - 51; 51 - 58 Jake 1 - 12 Beeseven 1	224 claims

(3) On July 22, 1966, Utica Mines granted Copper Ridge Mines Ltd. (N.P.L.) an option to acquire 50% of all Utica's rights and obligations in the claims. Copper Ridge exercised this option

and subsequently formed a new company, Copica Mines Ltd. (N.P.L.), later to become known as Nickel Ridge Mines Ltd. (N.P.L.).

(4) On April 1, 1967, Utica Mines assigned all its rights and interests in the claims to Copper Ridge in return for capital stock in Nickel Ridge and additional considerations.

(5) On July 7, 1967, Copper Ridge optioned claims Three Sisters 3 - 8 and Slowpoke #9 from Gloria Bolton and Paula Lawrence of Osoyoos.

Three Sisters 3 - 8	)	
Slowpoke #9	)	7 claims

Copper Ridge also staked the following claims at this time and acquired the Acme Fr. and Phoebe Crown Grants.

Nick 1 - 3	)	
Don 1 - 10 Frs.	)	
Lola 1 - 23	)	
Holin #1 Fr.	)	37 claims
Acme Fr. (Lot 1089 S)	)	
Phoebe (Lot 2790)	)	2 Crown Grants

On November 10, 1967, Newmont Mining Corporation of Canada Limited entered into an agreement with Copper Ridge and Nickel Ridge to explore all the above claims.

The following is a list of claims in good standing as of November 10, 1967, as covered by the above Agreement.

Claim Name	No. of Claims	Date of Expiry
Nick 1 - 3	3	Feb. 6, 1968
Slow Poke #9	1	April 20, 1968
Three Sisters #3 & #4	2	April 21, 1968
Old Nick #7; 9 - 12; 14 - 16; 18; 60 - 67	17	May 2, 1968
Old Nick H	1	May 2, 1968
Jake #1 - 12	12	May 2, 1968

Claim Name	No. of Claims	Date of Expiry
Old Nick 21 - 24; 36 - 45; 68 - 74; 100 - 124; 126	47	May 5, 1968
Old Nick A - D	4	May 5, 1968
MB 1 - 8; 20 - 31; 35 - 39; 42; 46 - 51*	32	May 5, 1968
Old Nick 77; 79 - 85; 87	9	May 10, 1968
Old Nick 175 - 190	16	May 16, 1968
Old Nick X 104 - X 141	38	May 16, 1968
Old Nick 151 - 162	12	May 20, 1968
Old Nick #3 Fr.	1	June 20, 1968
Old Nick #10 Fr.; #11 Fr	2	June 22, 1968
Holin #1 Fr.	1	July 25, 1968
Lola 1 - 21	21	August 16, 1968
Don #1 Fr. - #10 Fr.	10	August 24, 1968
Lola 22 - 23	2	August 24, 1968
Three Sisters 7 - 8	2	September 29, 1968
Three Sisters 5 - 6	2	December 19, 1968
MB 51 - 58 *	8	January 30, 1969
Old Nick 1 - 4	4	March 23, 1969
Old Nick 5; 6; 8; 13; 17; 19; 20; 25 - 28	11	May 2, 1969
Old Nick E; F; G	3	May 2, 1969
Old Nick 125; 127 - 129	4	May 5, 1969
MB 40 - 41; 43 - 45	5	May 5, 1969
Old Nick #1 Fr.; #2 Fr.	2	June 20, 1969
	272	

Mineral Leases	No. of Claims	Lease Expires
Acme Fr. (Lot 2790)	1	July 7, 1968
Phoebe (Lot 1089 S)	1	July 7, 1968
Total Number of Claims	274	

* There are two MB #51 claims:

Claim in Group MB 46 - 51 has record number 23223

Claim in Group MB 51 - 58 has record number 24948

Assessment work was filed by Newmont Mining Corporation of Canada Limited on the Nick 1 - 3 claims. These claims now expire February 6, 1969.

SUMMARY and CONCLUSIONS

The Newmont exploration program on the Nickel Ridge claims was completed during the winter of 1967 - 1968 and included geologic mapping, geochemical stream sediment and soil surveys, airborne and ground magnetometer surveys, bulldozer trenching, and rock sampling.

The Old Nick deposit was examined in detail. Pentlandite mineralization was found in a pyrometasomatic quartzite band, 2,600 feet long and approximately 400 feet wide, and in adjacent peridotitic-dunite dykes. Petrological work on the mineralized quartzite has revealed the presence of minute injections of basic rock into the sediments. The pentlandite is closely associated with these injections.

Nickeliferous zones, grading 0.15 to 0.25% nickel, were found to be remarkably uniform and continuous within the quartzite horizon.

Preliminary geochemical experiments in areas of known nickel occurrences clearly indicated that both soil and stream sediment sampling techniques outline areas of nickel-bearing rocks. Additional anomalies indicated by more extensive soil and stream sediment reconnaissance sampling programmes were examined during the investigations.

Airborne magnetometer surveys over the whole property have been successful in outlining certain major lithological units and structural zones within the Anarchist sediments and Nelson Intrusives. Variable and unusual distribution of magnetic minerals presented problems in the interpretation of ground magnetic surveys.

Microscopic studies have indicated that the pentlandite occurs as minute micron sized intergrowths in pyrite and pyrrhotite. This distribution presents serious metallurgical problems necessitating lengthy and complex metallurgical treatment to produce saleable products. The estimated, expected recovery using flotation, roasting and leaching benefication processes, is approximately 56%.

Under the present economic conditions, further exploitation of the nickeliferous mineralization occurring in the Bridesville area is not feasible.

LOCATION and ACCESS

The Nickel Ridge claim group lies in southern British Columbia close to the International Border. The Southern Transprovincial Highway passes through the property. The claims cover and surround the townsite of Bridesville, B. C., located 23 miles east of Osoyoos on the Southern Transprovincial Highway (Fig. 1).

Access within the claim group is good. Old logging roads provide direct access to almost any point within the claims. The now abandoned Great Northern Railway grade traverses the property south of Rock Creek and provides access for wheeled vehicles from both the towns of Rock Creek and Bridesville.

Twice daily bus service is available on the Southern Transprovincial Highway and an all-weather airport is located in Penticton, 60 miles from Bridesville. Daily flights are scheduled into Penticton from Vancouver by Canadian Pacific Airlines.

DESCRIPTION OF AREA

The Nickel Ridge claim group lies in the physiographic transition zone between the Cascade Mountain chain to the south and the Interior Plateau of British Columbia to the northeast. This area is roughly bounded by the north-south trending Okanagan Valley (elevation 910 feet at Osoyoos) and the generally north-south trending Kettle River Valley (elevation approximately 1,700 feet at Rock Creek).

Topographically, the area is a glaciated and maturely eroded highland. Mountain slopes are typically well rounded and partially covered by a thin veneer of glacial material. Major drainages (Rock, Baker, McKinney and Jolly Creeks - Fig. 1) are deeply incised with extensive high level stream terraces of fluvitile glacial origin. Elevations within the field area range from 3,000 to 4,500 feet.

Vegetation in the Bridesville area consists of scrub grasses and extensive stands of fir trees. The area is arid (approximately 18 inches annual precipitation) with summer temperatures staying about 80 - 90°. Winter temperatures range from 0 - 20° with heavy snow cover above 4,000 feet.

The local economy is dependent upon logging, light ranching, and tourists. Logging is by far the most important local industry, but is currently in a state of decline because the area cannot compete with near-coast timber sources.

HISTORY

One of the earliest gold discoveries in B. C. was made in Rock Creek in the early 1860's. Though this initial discovery proved to be of limited importance, a gold rush ensued and active prospecting has persisted in this area since.

Almost all early work was for gold. From the original gold find at the junction of Rock Creek and the Kettle River, placer gold was traced up Rock, Jolly, McKinney and Rice Creeks (Fig. 1). In 1897 the McKinney vein was located on Rice Creek. The McKinney vein contains free gold in a quartz gangue and was mined principally during the periods 1894 - 1904 and 1960 - 1962. It produced a total of 137,184 tons with 81,603 ounces of gold at an average grade of approximately 0.595 ounces per ton.

A second minor rush occurred following the discovery of lode gold in the McKinney vein. This resulted in the location of the Lemon, Waterloo, Victoria, Old England and Dayton groups, all gold properties, (Fig. 1). Despite continued exploration on these groups until the 1930's, no significant production is recorded.

Gold placers are still worked on Rock and Jolly Creeks, although little gold is produced.

In the early 1950's, two chromium shows were located and explored (Anarchist Chrome and Chrome Bell properties - Fig. 1). These occurrences proved to be of limited tonnage and of marginal grade.

In 1955, B. Fenwick-Wilson staked the Old Nick claims with the intent of investigating nickel values found in pyritic and pyrrhotitic sediments. This property was examined many times in subsequent years and was considered too low grade to be of value as a nickel producer.

In 1966, the adaptability of the sulfide bearing material to simple leaching procedures revived interest in the property. Fenwick-Wilson restaked 4 claims (Old Nick 1 - 4) over the main showings in March 1966 and optioned the property to Utica Mines in April 1966. The majority of the additional claims comprising the property were staked in April 1966.

Drilling by Utica Mines and later by Copper Ridge Mines substantiated the presence of nickel and pointed towards a large tonnage, low grade nickel deposit.

In November 1967, Newmont Mining Corporation of Canada Limited optioned the Nickel Ridge property.

GENERAL GEOLOGY

The most recent government mapping of the Bridesville area was completed by Little (G.S.C. Map 15-1961).

The Bridesville area lies within the Cordilleran intrusive belt. Essentially, the geology consists of Precambrian and Palaeozoic sediments intruded by Cretaceous intrusives. These older rocks are now partially covered by remnant caps of Cenozoic sediments and volcanics. Mineralization of note is confined to Cretaceous and earlier rocks.

The Precambrian Monashee Group, consisting of undivided metamorphosed sediments and volcanics, is regionally an uplifted, north-south trending, westerly dipping basement complex. The Okanagan Valley roughly defines the western contact.

Overlying the Monashee Group is the Permo-Triassic Anarchist Group. The Anarchist Group appears to represent a late Paleozoic basin of sedimentation and consists of undivided greenstones, quartzites, greywacke, and limestone. Airborne magnetometer work by Newmont shows greenstone to dominantly lie in the upper Anarchist Group and it probably constitutes a mappable stratigraphic unit. The Anarchist Group tends to be tightly folded and faulted along semi-regional northwest trends. More locally, in the Bridesville area, east-northeast trends are evident.

The Monashee and Anarchist Groups are intruded by the Cretaceous Nelson and Valhalla Intrusives. An early, ultra-basic phase of the Nelson Intrusives is mapped by Little in the Phoenix area to the east. Although partially obscured by more recent volcanics, the distribution of these ultrabasic bodies suggests an alignment in a west-northwest direction. A similar alignment is apparent in the Bridesville area and may be a westerly extension of the Phoenix trend. Following ultra-basic emplacement, the acidic Nelson Intrusives were introduced. These later intrusives consist of undivided granodiorite, quartz diorite, diorite, granite, quartz monzonite, syenite and monzonite. Changing composition probably represents well developed magmatic differentiation of a single magmatic phase. Pre-Cretaceous rocks in contact with the Nelson Intrusives show varying degrees of granitization.

The Valhalla Intrusives are believed to postdate the Nelson Intrusives and probably constitute a renewed stage of intrusion from the same source. This second intrusive phase consists of undivided granite and granodiorite and is readily differentiated from the Nelson Intrusives, with which they are commonly in contact, by the presence of allotriomorphic structure, smoky quartz, and the rarity of hornblende.

The Nelson and Valhalla Intrusives appear to be genetically significant as regards mineralization. All mineralization of note in this area has been found within the Cretaceous Intrusives, or in Pre-Cretaceous host rocks.

Remnant caps of the Paleocene-Eocene Kettle River formation unconformably overly the Cretaceous rocks. The Kettle River Formation consists of conglomerate, sandstone, shale and tuff. The sediments characteristically contain fragments of the older rocks and represent an erosion deposition cycle following regional uplift.

The Phoenix volcanics of Eocene or Oligocene age form a roughly north-south trending band in the map area and consist of andesite, trachyte, minor basalt, and locally interbedded shales and tuffs. This volcanic suite is not well developed in the Bridesville area but is quite extensive between Rock Creek and Greenwood, B. C.

The area was glaciated during the Pleistocene Period. Glacial deposits occur intermittently at higher elevations, but in the valleys, fluvio-glacial deposits are extensive and form spectacular features.

NEWMONT EXPLORATION PROGRAM

The exploration work by Newmont on the Nickel Ridge claims can be conveniently summarized as follows:

1. Geochemical stream sediment sampling of drainages covering the Nickel Ridge claims.
2. Geochemical soil sampling of the Old Nick and Bridesville W. grids.
3. An airborne magnetometer survey of the claim group and proximity.
4. A ground magnetometer survey of the Old Nick and Bridesville W. grids.
5. A limited EM survey on the Old Nick grid.
6. Geological mapping of the Old Nick grid area, reconnaissance mapping of other zones.
7. Bulldozer stripping and sampling of mineralized zones.

DETAILED GEOLOGY

Primary emphasis on the Nickel Ridge claims has been centered on the Old Nick grid. The Old Nick grid lies south of the Rock Creek Bridge, primarily on the south side of Rock Creek. The grid area is accessible from a farm road across Baker Creek and along the abandoned Great Northern railway grade.

The rocks underlying the Old Nick property are of the Anarchist Group. The extreme northeast portion of the grid extends across the contact with the Nelson Intrusives. Ultrabasic dykes, of an early magmatic phase of the Nelson Intrusives, cut the Anarchist Group at several locations. Shallow overburden, 5 to 15 feet, obscures approximately 80% of the surface. Rock types are typically highly altered and have presented difficulty in both identification and correlation.

Stratigraphy and Lithology

The stratigraphy of the Anarchist Group is not well understood. Rock types of this group, encountered on the grid area, consist of quartzites, interbedded meta-shales and thin bedded quartzites, and greenstone (Fig. 3). In the area of the nickel showings, the stratigraphic section in upward succession is as follows. The relative age of each of the units has not been determined.

1. Interbedded meta-shales and quartzites;
2. Massive pyrometasomatic quartzites with minor interbedded meta-shales, approximately 400 feet in thickness;

3. Interbedded meta-shales and thin bedded quartzites, approximately 200 feet in thickness;
4. Greenstone, approximately 250 feet in thickness;
5. Banded quartzite.

The Anarchist meta-sediments are cut by several ultrabasic dykes and sills, varying from 30 to 100 feet in width (Fig. 3). The dikes have experienced a complex metamorphic and metasomatic history and are classified as peridotite in the hand specimen.

Peridotite is found as sill-like masses. Sections of peridotite cut by diamond drilling show apparent widths of up to 30 feet. Peridotite also occurs as 1/2 inch to 3 inch laminae concordant with bedding, within the meta-sediments. The peridotite dykes and sills are believed to have originated from the same source.

Nickel bearing pentlandite occurs with pyrrhotite and pyrite in the Anarchist meta-sediments. These sulphides favour altered quartzite horizons. The nickel is believed to have been introduced along with the ultrabasic intrusives.

On the extreme northeast portion of the grid area, a quartz diorite phase of the Nelson Intrusives is exposed. Contact metamorphism is apparent in the Anarchist sediments over widths up to 700 feet adjacent the contact.

<u>Rock Types</u>

<u>Unit 1</u> - Interbedded meta-shales and quartzite

This unit is generally susceptible to erosion and is poorly exposed. Unit 1 is defined primarily on the basis of predominant meta-shales.

The quartzite constitutes approximately 15% of the unit and occurs generally as beds 5 to 10 feet in thickness within the meta-shales. However, beds 4 to 12 inches in thickness are also present. The rock is typically a fine grained grey to grey-black quartzite, often with thin (1/2 to 1 millimeter) contorted laminae of now silicified graphite. The quartzite generally contains $<1\%$ pyrite and minor chlorite and sericite. Locally, minor pyrrhotite is found.

The meta-shales are typically very fine grained to aphanitic, black or red-brown schistose rocks. Thin laminae of red-brown biotite are characteristic. Locally, zones show strong silicification. Microscopically, the biotite laminae consist of biotite-quartz-plagioclase and quartz-hornblende assemblages with minor tourmaline and sphene, biotite being the principal constituent.

In some areas, peridotite is injected as thin 1/2 inch to 3 inch beds concordant with the bedding.

Unit 2 - Predominantly quartzite

Unit 2 is a relatively massive, competent pyrometasomatic quartzite bed about 400 feet in thickness. Thin meta-shale horizons, as described in Unit 1, are interbedded. Unit 2 is erosionally resistant.

The quartzite is typically highly silicified and altered and the original lithology of this zone is somewhat speculative. Although this unit now has the composition and general texture of a badly altered quartzite, relic meta-shale textures in this unit suggest it may be, at least in part, a zone of intense silicification. Consequently, reference to the whole unit as quartzite is not an accurate description.

The rock in the hand specimen is a generally fine-medium grained, grey to greenish-white quartzite with much remobilized quartz. Sericite and chlorite occur as fine fracture fillings. The quartzite typically has from 1 to 2% disseminated pyrite, although locally this mineral constitutes 20% of the rock, and 1/2 to 1% pyrrhotite as fine disseminated grains. Unit 2 is often heavily limonite stained and badly fractured. Peridotite is found within Unit 2 as sill-like masses up to 30 feet in apparent width and as bands 6 to 12 inches in width concordant with bedding. Sections of the sedimentary sections of this unit have a diagnostic greenish hue.

Thin section analysis by D. M. Hausen indicates the following:

i) The siliceous sediment is a pyritized-quartz-sericite rock in which finely micro-crystalline quartz is penetrated by veinlets of sericitic micas, chlorite, and sulphides.

ii) The rock appears to have been formed by hydrothermal replacement or alteration of siliceous rocks near quartzite in composition.

iii) The green color of replacing veinlets is attributable to the presence of chlorite and composition of sericitic micas. The sericitic mineral is near mariposite in composition.

iv) Sulphides are associated with the sericite-chlorite veinlets and show pentlandite to occur as minute intergrowths in pyrrhotite and pyrite. Pyrite is the dominant sulphide. Trace quantities of chalcopyrite and sphalerite have been identified, and these minerals are also intergrown with the pyrite.

v) Veinlets display sharp contact boundaries with the host quartzite and appear to have been injected into the quartzite as a fluid or as microscopic apophyses of an igneous intrusive. Relic textures in these injections are porphyritic and indicate a primary composition near norite with porphyritic crystals of hypersthene. The veinlets have subsequently undergone alteration in situ to chrome micas and chlorite with contemporaneous formation of sulphides.

<u>Unit 3</u> - Interbedded meta-shales and quartzites

Unit 3 is very similar to Unit 1 except the quartzite is a dominant constituent making up approximately 60% of the unit.

The quartzitic bands are fine grained and grey-black in color, and commonly contain fine contorted graphitic laminae. The rock also contains up to 1% pyrite and very minor chlorite and sericite.

The description of the meta-shale is as in Unit 1. Unit 3 is not a favourable horizon for nickel mineralization.

Unit 4 - Greenstone

Greenstone is typically a highly altered, very fine grained, greenish-black basic rock. It contains numerous small stringers of quartz and calcite and up to 2% disseminated pyrite. Magnetite is sparsely distributed through the rock. This greenstone is thought to be a highly metamorphosed volcanic flow.

Unit 5 - Banded quartzite

Unit 5 is poorly exposed in the grid area. It consists of alternating zones of red-brown and light green-black banded quartzite. The red-brown colour is due to the presence of fine grained biotite laminae.

The light green-black horizons contain chlorite in addition to biotite in the laminae.

Ultrabasic Dyke Rock - Peridotite

Two ultrabasic dykes have been located on the grid area. It is thought that additional trenching will probably further delineate dyke extensions and locate new dyke structures.

Dykes are structurally controlled by, and emplaced in west-northwest striking steeply dipping fault zones. Weaker north-northeast striking steeply dipping shears also structurally limit dyke development and are thought to predate dyke emplacement. It is probable that the west-northwest fault zones have acted as channel-ways for ultrabasic magmas.

In a hand specimen, the ultrabasic dyke is a dark-greenish-black to black, very fine grained, pyrrhotitic peridotite. Zones within the dyke contain 2 millimeter spherulitic growths of tremolite. The host rocks adjacent the dyke contacts have been saturated with basic fluids for a distance of 2 to 6 feet.

Thin section analysis by D. M. Hausen indicates the following:

> The dyke rock is an altered peridotite near dunite in composition. The rock is intensely serpentinized and variably replaced by tremolite, anthophyllite, chlorite and talc.
>
> The microscopic studies suggest that the primary olivine has been replaced by tremolite and anthophyllite, accompanied by the development of intergrown pentlandite and pyrrhotite. The amphiboles, in turn, have been replaced to a certain degree by serpentine and talc.
>
> Pentlandite and pyrrhotite are found both in the early amphiboles, and in later serpentine and talc.

It has been noted that chlorite veinlets cut sulphide masses and postdate sulphide development in the basic rock.

No pyrite has been identified in the ultrabasic dyke rocks.

Silicate nickel occurs in minor amounts (0.0X%) in the olivine and serpentine fractions of the peridotite. The nickel content of dyke rock in surface trenches generally runs approximately .25% nickel.

Ultrabasic Sills - Peridotite

Peridotite sills are very susceptible to erosion and are seldom seen in surface exposures. Several trenches and diamond drill holes cut zones of peridotite intruded into the meta-sediments. Peridotite is most commonly found in Unit 2, the pyrometasomatic quartzite, and to a limited extent in Unit 1, interbedded meta-shales and thin bedded quartzite.

Peridotite sills tend to be a dark green to green-black, aphanitic, talcose, soft rock. They generally carry from 1 to 2% pyrite and locally, minor pyrrhotite. Pentlandite has not been identified in a hand specimen.

Rocks of Units 1 and 2 often exhibit thin talcose development on joint surfaces, representing an alteration product of the peridotite. It is believed that the peridotite sills are genetically related to the ultrabasic dykes. It is also considered that this intrusive peridotite phase is the source of nickel mineralization which has become dispersed in the pyrometasomatic quartzite.

It is interesting to note that pyrite occurs in the peridotite sills, but not in the peridotitic dunite dyke rock.

Total nickel assays of peridotite sills are variable and run from .01 to .15% nickel.

STRUCTURE

The grid area is structurally complex (Fig. 3). Bedding is tightly folded and cut by several fault trends.

On the south side of Rock Creek, a westerly plunging recumbent fold has been mapped. The axial plane of this fold strikes ENE and dips 30° S. The structural pattern is complicated by strong, steeply dipping E-W to N 70° W faults. Weaker, but probably contemporaneous vertical faults trending N 10° E and N 40° E have also been mapped. A ground magnetometer survey suggests a dominant N-W fault trend, although, this direction is not evident on the ground. North of Rock Creek, bedding attitudes are contorted but generally trend E-W with 10 to 30° northerly dips.

Ultrabasic intrusives are structurally controlled by the dominant WNW striking fault zones. NNE fault trends have also influenced the outcrop pattern of dykes (Fig. 3). It has not been determined whether these cross faults pre or post-date the ultrabasic intrusion.

MINERALIZATION

The distribution of nickel mineralization in the rocks underlying the Old Nick grid has been described.

Nickel sulphides occur in two rock types:

1. In peridotitic dunite rocks as pentlandite occluded in pyrrhotite. Pentlandite and pyrrhotite both occur in amphiboles, serpentine, and talc in the altered dunite. Nickel occurs in the form of silicate nickel in relic olivine in very minor amounts.
2. In a pyrometasomatic quartzite comprising Unit 2 of the Anarchist Group, pentlandite occurs as minute intergrowths with pyrrhotite and pyrite, in fine sericitic-chloritic veinlets.

Widespread sulphide nickel in a quartzite is an extreme geologic rarity. J. A. Chamberlain, of the G. S. C. (Personal Communication) states nickel dispersion into sediments from a basic source is generally of limited extent, a maximum of 8 feet being recorded for pentlandite. He also suggests that a mechanism other than traditional high grade contact metamorphism has been operative in the Bridesville area.

Two modes of genesis are suggested for nickel mineralization within the pyrometasomatic quartzite.

1. Extremely high pressure accompanying a late magmatic phase of the ultrabasic intrusive causing basic fluids to be injected into the competent and probably brittle quartzite. Nickel sulphides separated during the cooling of basic fluids.

2. Remobilization of nickel contained in earlier formed primary silicates by fluid phases invading the crystalline ultrabasic rocks followed by dispersion into the sedimentary horizons. Fluid phases capable of this remobilization may have been: (a) granitization fronts or; (b) volatiles from late stage cooling of the Nelson Intrusives. The composition of these mobilizing phases were such as to allow separation and crystallization of sulphide minerals.

The second mode of genesis (2) is favoured.

ECONOMIC CONSIDERATIONS

Grade of Mineralization

1. Previous Drilling

Nine diamond drill holes and 26 percussion holes were drilled on the Nickel Ridge property by Utica Mines and Copper Ridge Mines. The majority of these holes were drilled on the Old Nick grid (Figs. 3 and 4). All holes were assayed for nickel.

Four short diamond drill holes (DDH 1 - DDH 4) were drilled by Utica Mines in 1966. Holes DDH 1 - DDH 3 were collared in nickeliferous quartzite and DDH 4 in a peridotite dyke. DDH's 1 - 3 intersected grades of 0.15 to 0.26% nickel in quartzite and 0.10 to 0.33% nickel in basic intrusive rock. Assayed sections of peridotite dyke rock in Hole 4 grade 0.15 to 0.22% nickel.

Relatively deep diamond drill holes (DDHN 1 - DDHN 5) were drilled by Copper Ridge Mines in 1967. Holes DDHN 1 and DDHN 2 intersected nickeliferous quartzite and give a good picture of mineralization at depth. Hole DDHN 1, collared in nickeliferous quartzite, indicates a minimum apparent width of 420 feet of mineralized quartzite, grading 0.195% nickel. Typically, grades range from 0.07% nickel to 0.26% nickel. One 10 foot section returned an anomalous 0.52% nickel. Hole DDHN 2 intersected an apparent width of 272 feet of nickeliferous quartzite with grades ranging from 0.05% nickel to 0.25% nickel. Holes DDHN 3, DDHN 4, and DDHN 5 failed to intersect significant mineralization, hole DDHN 3 being lost before reaching its projected target.

A number of percussion drill holes, 40 feet to 200 feet in length, were drilled by Copper Ridge Mines with an Atlas Copco O.D. drill (Figs. 3 and 4). Holes P 2, P 3, P 5 to P 10, P 12, and P 16 intersected significant nickel mineralization in quartzites and holes P 19 to P 23 intersected nickel bearing peridotite dykes. Assay results are summarized below:

Hole Number	Nickel Grades
P 2	0.18% Ni/22' - 140'
P 3	0.175% Ni/5' - 157'
P 5	0.082% Ni/3' - 103'
P 6	0.196% Ni/12' - 145'
P 7	0.25% Ni/5' - 40'
P 8	0.32% Ni/17' - 60'
P 9	0.245% Ni/7' - 60'
P 10	0.164% Ni/15' - 100'
P 12	0.171% Ni/12' - 125'
P 16 (Flat hole - Fig. 4)	0.152% Ni/32' - 137'
P 19	0.085% Ni/120' - 200'
P 20	0.22% Ni/10' - 80'
P 21	0.19% Ni/30' - 70'
P 22	0.214% Ni/2' - 95'
P 23	0.205% Ni/110' - 130'

Correlation between assay results from diamond drilling and percussion drilling is good with no vast discrepancies apparent.

2. Bulldozer Trenching and Sampling

Trenching confirms nickel to be stratigraphically controlled, following pyrometasomatized quartzite bands. It is found that nickel grade is not a function of total sulphides in the quartzite. Heavily pyritic or pyrrhotitic samples do not necessarily contain more nickel than samples containing smaller amounts of visible sulphides.

An assay plan (Fig. 4), shows nickel grade to be remarkably uniform and continuous over a strike length of at least 1,400 feet. No sections containing more than 0.35% nickel were intersected by the trenching and nickel grades within the quartzite are typically 0.15% nickel to 0.20% nickel.

In consideration of drilling and trenching results to date, it is thought a considerable tonnage of mineralized rock grading approximately 0.15 to 0.25% nickel can be delineated by further drilling.

Metallurgical Studies

Preliminary metallurgical studies have been made on nickel bearing rock from the Nickel Ridge property by Utica Mines, Britton Research Ltd., and Newmont Exploration Limited.

The pentlandite occurring in this low grade mineralization is characteristically occluded within larger crystals of pyrite and pyrrhotite. Separation of the pentlandite from the other sulphides is not considered to be economically feasible by fine grinding because of the fine interlocking character of the sulphides.

The sulphides are amenable to gravity and flotation concentration. Flotation tests by Britton Research Ltd. have indicated that a concentrate containing 0.76% nickel can be obtained from mineralization assaying 0.195% nickel representing a recovery of 76.7%. Hausen has been able to concentrate sulphides using heavy media and micropanning methods resulting in a concentrate assaying 1.12% nickel from mineralization assaying 0.193% nickel.

A low-intensity magnetic separation test by G. A. Ekins of Utica Mines gave the following results:

Product	% Weight	Assays		Distribution %	
		Nickel	Sulphur	Nickel	Sulphur
Magnetic concentrate	1.5	1.97	29.05	13.0	18.1
Tailing	98.5	0.20	2.05	87.0	81.9
Head (calculated)	100.0	0.23	2.27	100.0	100.0

It is apparent that this method of concentration is not adaptable to this type of mineralization. Preliminary biological leaching tests by Utica also gave disappointing results although these experiments were not exhaustive.

From these preliminary experiments, it is concluded that simple concentration methods, particularly flotation and gravity, can be expected to yield a concentrate containing approximately 1% nickel. A product of this grade is not economical to transport and it is apparent that further benefication is necessary to produce a marketable product.

Preliminary Economic Analysis

Mr. J. C. Yannopoulos, of the metallurgical research facility of Newmont Exploration has studied all the available metallurgical data on the Bridesville mineralization and has concluded that a two-stage benefication process is necessary. A concentration step, probably flotation, seems to be an absolute prerequisite. The flotation product is expected to be similar to the nickeliferous pyrrhotite concentrate of Inco's Copper Cliff plant (58% iron, 0.75% nickel, 0.05% copper, and 37% sulphur).*

The Inco process consists of the following steps:

(a) Roasting to remove sulphur and form nickel ferrite.

(b) Nickel reduction at ~ 1000° F in a controlled reducing gas atmosphere.

(c) Leaching in aerated ammoniacal ammonium carbonate.

(d) Non-ferrous recovery, which recovers basic nickel carbonate.

(e) Agglomeration of magnetite.

This process yields marketable iron ore pellets and crude nickel carbonate requiring further refining.

A preliminary study, using existing experimental results and information that is available concerning the operation of Inco's Copper Cliff plant, indicates that a 75% recovery can be anticipated from a flotation process, and further roasting and leaching would recover 75% of the nickel contained in the flotation concentrate. This would give a net recovery of approx-

* The pyrrhotite concentrate is the third concentrate of the Copper Cliff mill. Copper and nickel concentrates are the main products of the mill which is fed with ore containing ~ 1% Ni and 1% Cu.

imately 56%.

A small magnetite credit as a by-product from the roasting and leaching process can be expected. However, the overall net return from the sale of the nickel and iron products would be too low to justify a large scale, open pit mining operation.

Conclusion

The Nickel Ridge prospect is not economically feasible. This is mainly because of low nickel recovery ($\sim$ 56%) in a rather complicated metallurgical process.

C. P. Costin.

Supervised by:

G. W. H. Norman, P. Eng.

REPORT ON THE GEOCHEMICAL WORK CARRIED OUT ON THE NICKEL RIDGE PROPERTY, BRIDESVILLE, BRITISH COLUMBIA.

GREENWOOD AND OSOYOOS MINING DISTRICTS

N.T.S. 82-E-3

INTRODUCTION

This report presents the results of a reconnaissance stream sediment survey and more detailed soil surveys on the Nickel Ridge property. Samples were collected from all streams draining the claimed area and the survey extended beyond the limits of the property to the east, south and west. Soil samples were collected along picket-line grids over the main showing, centrally located on Old Nick #3 claim, and in the headwaters of an anomalous stream north and west of the Bridesville townsite.

SAMPLE COLLECTION

1. Stream Sediment Samples

At the commencement of the survey, closely spaced stream sediment samples were collected in the vicinity of the known nickel indications on the Old Nick #3 claim, approximately 1/4 mile southeast of the Rock Creek bridge. This closely-spaced sampling survey was extended beyond the known area of mineralized rock in order to get some indication of the background levels in the area.

This initial work indicated that nickel values away from the showings are commonly less than 40 ppm Ni, the majority of values occurring in the range 20 - 30 ppm Ni. Closer to the mineralized zone, however, values in excess of 50 ppm Ni are characteristic, with the highest figures exceeding 100 ppm.

After a study of this range of results and the distribution of the samples, it was concluded that reconnaissance samples could be collected at 1/4 mile intervals in order to adequately prospect the surrounding country for nickel. Using this sample interval, values in excess of 40 ppm Ni would be considered significant.

The reconnaissance survey extended over the whole of the Nickel Ridge property. Two samples were collected within 50 feet of each other at each sample point and the values presented in Figs. 5, 6, and 7 represent the average value of determinations on each sample.

2. Soil Samples

The overburden in the Bridesville area includes both residual and transported types. Fluvio-glacial features are topographically distinct along the length of the Rock Creek drainage and locally there are extensive and deep accumulations of this material. At higher elevations, particularly in areas of more rugged relief, the soils are dominantly residual and interspersed with only limited transported material.

In the area of the known nickel occurrences on the Old

Nick #3 claim, much of the fluvio-glacial material has been removed by recent erosion along the southern bank of Rock Creek. Patches of this glacially-derived overburden are still present and narrow terrace features are recognizable.

A preliminary survey along the existing picket lines on the Old Nick #3 claim was the first soil sampling to be completed. Samples were collected at 100 foot intervals at depths of up to 30 inches depending on the depth to the weathered bedrock surface.

Despite the local accumulations of transported overburden, the anomalous nickel pattern obtained, clearly indicated the known occurrences of nickel in the bedrock, and the strike of the nickel anomalies agreed with the geological interpretation of favourable lithology and structure. A limited amount of downslope displacement of the anomaly is apparent and it is likely that the transported overburden contains both nickel derived by vertical movement of metal from the bedrock since the deposition of the overburden, and mechanically derived bedrock fragments incorporated during its formation.

Following this initial work, the extent of the survey was expanded to prospect the area covered by Figs. 8, 9 and 10.

GEOCHEMICAL ANALYSIS

Both the stream sediment and soil samples were analysed in the Newmont trailer-laboratory located in Princeton. All samples were dried and sieved in the laboratory and the minus 80 mesh material retained. Weighed amounts of the samples were heated for approximately 3 hours with concentrated perchloric acid until all the sample material had completely reacted. The leach solution was then diluted and copper, nickel, and zinc content determined by atomic absorption spectrophotometry using the Techtron AA-4 instrument. The analyst was Mr. D. L. Murray.

GEOCHEMICAL RESULTS

1. Stream Sediment Survey (Figs. 5, 6, and 7)

(A) Nickel (Fig. 5)

Within the surveyed area, three significant areas, characterized by an excess of 40 ppm Ni in the stream sediments, were outlined by the survey. These areas are as follows:-

(a) The area of the Old Nick Grid;

(b) The area of the Bridesville West Grid;

(c) An area approximately 2 miles southeast of the centre of the Old Nick grid where anomalous values are present in the headwaters of two tributaries.

A small number of additional anomalous indications were detected, but these occurrences are singular and very minor compared with the areas outlined above.

The range of values in the anomalous area surrounding the Old Nick showings is quite large, varying between 20 and 278 ppm Ni. The previously known nickel occurrences are all indicated by the geochemical results. Follow-up soil surveys have defined the extent of these mineralized occurrences in more detail.

The Bridesville West anomaly was originally thought to be due to human contamination. However, detailed sampling upstream of farm buildings established the validity of the anomaly. Stream sediment values range from 31 to 172 ppm Ni. A soil sampling grid was surveyed over the indicated area of interest to allow more detailed investigation.

More detailed work in the area of the third anomalous area to the southeast of the Old Nick grid was deferred pending a more thorough investigation of the more strongly anomalous zones. Nickel values in this area range from 19 to 91 ppm Ni.

(B) Copper (Fig. 6)

The copper values over the whole of the surveyed area range from less than 10 ppm to 148 ppm Cu. Preliminary statistical evaluation of this data indicated that values less than 45 ppm Cu belong to a distinct frequency population. This concentration of values is interpreted as representing the background content of the bedrock in the area. Values in excess of 45 ppm Cu do occur, but are coincident with the two most prominent nickel anomalies previously described. It is noticeable, however, that anomalous copper values are more strongly represented in the Bridesville West grid.

(C) Zinc (Fig. 7)

Zinc values in the stream sediments range from less than

20 ppm to 275 ppm Zn. From histogram studies, the values lower than 70 ppm Zn constitute the background range. Values greater than 70 ppm Zn are present in the Bridesville West and Old Nick areas, along the lower course of McKinney Creek, and along Rock Creek north of the known nickel showings. These latter anomalies indicate possibly mineralized areas to the north of the area of interest. Lead and zinc sulphides are associated with gold in quartz veins at the Camp McKinney property approximately 5 miles due north of Bridesville.

2. Soil Surveys

(A) Old Nick Grid

The distribution of nickel, copper and zinc in the soil in the vicinity of the Old Nick showings is illustrated in Figs. 8, 9, and 10. From a study of these three maps, it is apparent that there are marked contrasts in the distribution of the three metals in the soil. The upper limit of background for the three metals is as follows: Ni - 65 ppm; Cu - 45 ppm; and Zn - 85 ppm.

The nickel anomalies outlined on Fig. 8 are clearly defined and the patterns clearly reflect the broad geological structure (Fig. 8). The old workings on the property are all included in the main anomalous zone and the better mineralization encountered in the earlier drilling project to surface within this same zone.

Some distortion and discontinuity in the nickel patterns results from the influence of topography and the irregular distribution of the deeper patches of transported overburden. A general east-north-east trend is clearly defined, coincident with a mapped band of altered quartzite containing the nickel mineralization. Narrow appendages extending from 4W, 10S to 12E, 2S and 16E, 8S to 20E, 5S closely follows mapped geological contacts suggesting these structures represent relative zones of favourability for the nickel mineralization. Anomalous nickel values also occur in areas of ultrabasic rocks (20E, 5S) known to contain nickel mineralization and a similar association occurs at 8E, 7N.

The copper and zinc soil patterns (Figs. 9 & 10) do not have any direct correlation with the geological features. There is some coincidence with the nickel pattern north of the baseline, east of line 20E, and along lines 8E, 12E and 16E. In both these areas, coarse grained basic rocks have been recognized, but, in contrast to the ultrabasic rocks previously referred to, these occurrences do not contain visible mineralization.

(B) <u>Bridesville West Grid</u>

The geochemical soil sampling on the Bridesville West grid was carried out to investigate, in more detail, the geochemical stream sediment anomalies detected in the area.

The details of this sampling are recorded in Figs. 11, 12 and 13. Contours have been drawn to include values in excess of 85 ppm Ni, 65 ppm Cu, and 90 ppm Zn. The sampling procedure used for the Bridesville West survey was identical to that followed on the Old Nick grid.

The nickel patterns are illustrated in Fig. 11. Three prominent anomalies are apparent:-

(a) A linear anomaly trending northeasterly from 16W, 11S to 20E, 4N.

(b) A northwest trending anomaly in the extreme north-eastern section of the grid, and

(c) An anomalous zone extending northeasterly from 16W, 38S.

The anomalous zone (a) outlines in part the valley bottom of the anomalous stream detected in the stream sediment survey. The anomalous values are restricted to the swampy sections of the present drainage and continue in an easterly direction towards the farm-yard along an abandoned channel. Some anomalous nickel values have been detected along the present drainage channel to the north of the well-defined linear anomaly (see Fig. 11).

Two possibilities have to be considered in the interpretation of this anomaly. The first possibility is that a nickel-bearing source underlies the drainage channels. The second is that the anomalous nickel has been transported in solution and concentrated by precipitation in the stream bank and swamp environment. The above description of the location and occurrence of the anomalous values supports the transported origin. A nickel-bearing source may underlie the drainage, but reference to the more widely dispersed zinc patterns (Fig. 13) suggests that some of the nickel has been derived by groundwater seepage from anomalous areas characterized by above-normal amounts of zinc and nickel. The anomaly centred near 16W, 16S is related to a band of quartzite similar to the sediments present on the Old Nick grid, but is unmineralized and reacts negatively with dimethylglyoxime. Other anomalous nickel areas in the vicinity of the linear anomaly were examined geologically but no mineralization was observed. It is likely, therefore, that the linear anomaly represents a concentration of metal transported into the stream environment by groundwaters draining areas of bedrock containing very minor amounts of nickel.

Anomalous area (b) is the most attractive in the area. The axis of the anomaly follows a small, but distinct, linear depression trending in an approximate northwesterly direction. The rocks to the west of this lineament are more indurated than the shales and quartzites occurring to the east and this relationship suggests the presence of a fault or shear. Small bodies of peridotite occur in outcrops and the same rock type is represented by float near the northwestern limit of the largest anomalous zone characterized by values in excess of 125 ppm Ni. However, these ultrabasic rocks are devoid of sulphides. Closer to the lineament near co-ordinate 28E, 15N, minor pyrite is present in basic rocks intruded into quartzite but no positive indication of nickel has been obtained.

The evidence that has been collected strongly suggests that minor amounts of nickel are present in rocks adjacent to a shear or fault zone. The nickel has probably been introduced along with injections of peridotite. No significant concentrations of nickel mineralization are present.

Nickel anomaly (c) is located in an area of pyritic quartzite. No nickel was evidenced by dimethylglyoxime in this rock but 0.02% Ni has been detected in heavy pyrrhotite located along a shear near the eastern boundary of the anomaly.

The nickel anomalies elsewhere in the area covered by the Bridesville West grid are relatively small. The anomalous sections in the southeastern part of the grid occur on the strike extension of pyrrhotitic, iron-stained quartzite beds exposed along the Transprovincial Highway. No significant nickel values have been detected in these exposures.

The majority of the copper and zinc anomalies (Figs. 12 and 13) are wholly or partially coincident with the nickel anomalies previously described. The zinc patterns are generally broader; this, very probably, being a reflection of greater mobility of zinc in the local environment.

A transported origin is suggested for the copper and zinc anomalies coincident with nickel anomaly (a). Other zinc anomalies commonly follow a northeasterly direction paralleling the general geologic strike. This suggests that certain geological horizons are relatively enriched in this metal. The N 40° W trending copper anomaly passing through 16W, 40S is unexplained. The higher values within this anomaly coincide with the outcrop area of pyritic quartzite surrounded by nickel anomaly (c).

The most striking feature obtained from the Bridesville West soil survey is the singular importance of nickel in the anomalous area in the extreme northeast of the grid. In other anomalous areas, nickel, copper and zinc are closely associated. From a study of the results obtained from the Old Nick grid survey, it is apparent that nickel anomalies not coincident with zinc and copper anomalies should be given special consideration. However, the area north of the farmyard has not yielded any geological evidence indicating the presence of significant nickel mineralization.

No follow-up work was carried out in the area of the third geochemical stream sediment anomaly because of the disappointing geological results obtained during the investigation of the known mineralization and anomalies on the Old Nick and Bridesville West grids.

....
J. Alan Coope.

Supervised by:

....
G. W. H. Norman, P. Eng.

NEWMONT MINING CORPORATION OF CANADA LIMITED

REPORT ON HELICOPTER MAGNETIC SURVEY

OF BRIDESVILLE, B. C.

OLD NICK AREA NICKEL RIDGE OPTION

LOGISTICS:

Instrumentation	-	Newmont Proton - precession magnetometer; printer readout; 20 gamma noise envelope; sensor towed 100 feet below aircraft.
Drift Control	-	tie lines on 3 mile intervals
Flight line spacing	-	lower half - 1/4 mile upper half - 1/2 mile (both nominal)
Flight line orientation	-	E-W
Flight path recovery	-	Visual, employing 1/4 mile = 1 inch aerial photos - check points nominal 1/2 mile intervals.
Estimated positional accuracy	-	1/8 mile
Operator	-	F. P. DeMeyer
Helicopter	-	Hiller 12 E, provided by Okanagan Helicopter Limited.
Nominal Traverse speed	-	60 mph.
Nominal Terrain clearance	-	400 feet
Total coverage	-	250 line miles

Work completed in March, 1968.

PRESENTATION

Base map - prepared from 1/4 mile = 1 inch photos, principal cultural and drainage features displayed.

Data - contoured on 100 gamma intervals, flight paths shown, numerals indicate fiducial numbering system, range 0 - 999; read sequentially to indicate flight direction.

Contouring and drift correction by W. M. Dolan.

INTERPRETATION

The procedure was to attempt to correlate the magnetics with the geology as presented on the regional geologic map of the Osoyoos area (NTS: 82 - E/3 E and W).

Generally, the magnetic relief is remarkably low, being in the order of a few hundred gammas. However, in the eastern portion of the area, the Tertiary volcanics (described as andesites and trachytes) exhibit magnetic anomalies in excess of 1000 gammas.

The Anarchist Series of alternating greenstones and sediments does not exhibit a uniform magnetic "texture". Consequently, two units have been identified on the basis of magnetics. Both fall within the area mapped as Anarchist.

The suggestion is that the majority of the southern half of the block consists of alternating variably magnetic greenstones and meta-sediments with pronounced E-W trending folds.

Owing to the E-W flight line orientation, the fold axes and limbs cannot be identified with sufficient accuracy to warrant a presentation.

Predominantly N-E trending faults and fractures are recognized across the entire area. Where identifiable with reasonable certainty, they are illustrated on the accompanying map.

Evidence for intrusive activity is only recognized in three instances. These are dominantly portrayed by:

(1) The fourth flight line from the bottom of the map, about 1/2 mile west of tie line #1. This may be simply a greenstone, but a small plug, likely of basic composition is suggested.

(2) On tie line #1, centering about two miles from the bottom of the map.

Unfortunately, the distribution of traverse lines does not allow a complete portrayal of this feature.

Examination of the aerial photos plus the magnetics leads to the tentative conclusion that the strong magnetic anomaly represents a portion of a larger intrusive whose N-W boundary coincides with the vicinity of the Old Nick Group showings.

Obviously, assymmetric and exceptional differentiation of the intrusive is implied, the more acid side coinciding with the nickel mineralization.

Data quality does not permit an accurate interpretation of depth, but depths in excess of a few hundred feet are not inferred.

The geochemical and geological knowledge at hand does not refute the above described conclusions.

It is noteworthy that nickel mineralization tends to prefer the more basic portions of intrusives. Accordingly, our conclusions are at odds with this characterization.

(3) At the north-central boundary of the map, the Nelson Intrusives appear to be statistically reflected by the magnetics, about 1/4% magnetite being suggested.

The above observations and deductions are illustrated by the interpretation superimposed on the data map.

....
W. M. Dolan, M. Sc.,
Chief Geophysicist.

Supervised by:

....
G. W. H. Norman, P. Eng.

NEWMONT MINING CORPORATION OF CANADA LIMITED

REPORT ON GROUND GEOPHYSICAL COVERAGE

OLD NICK GROUP, BRIDESVILLE, B. C.

LOGISTICS:

Magnetometer	-	Sharpe MF-1
Station Intervals	-	50 feet
Line Interval	-	400 feet
Total coverage	-	23 line miles
Line Orientation	-	N-S
Operator	-	Martin Johnson

Contouring and Interpretation by W. M. Dolan

Work completed in March, 1968.

PRESENTATION:

One map entitled Old Nick Group covers the nickel showings immediately south of Bridesville. The scale is 1 inch = 200 feet.

The data is contoured on 100 gamma intervals.

The interpretation is superimposed.

A second map entitled Bridesville West Group presents the data from that area on a scale of 1 inch = 400 feet.

Again, the contour interval is 100 gammas.

Again, the interpretation is superimposed, though with a slightly different format owing to the smaller scale.

In both instances, traverse lines are separated 400 feet.

An index map showing the location of the two blocks accompanies.

COMMENTARY

Old Nick Group

An attempt was made to correlate the magnetics and the geologic mapping performed by C. P. Costin.

The geology is, of necessity, somewhat fragmentary owing to infrequent exposures. Despite that, the almost total lack of correlation between the geology and the magnetics is disconcerting. Because of this, the magnetic units were categorized by deduced percent magnetite, rather than by rock type.

The comparison between the magnetic deductions and the nickel soil survey map is somewhat better. Obviously, the N-E faults (dominantly left-hand faults) appear to exert some influence over the nickel pattern, though the general trend of the nickel is almost in total agreement with the geology and consequently almost counter to the magnetic trends.

It is noteworthy that a different interpretation of the magnetics is permissible in places which is even less consistent with the geology. However, the overall logic of the magnetics favours the portrayal shown.

In part, the enigma is attributable to the magnetic station density (i.e. 200' line spacing would have provided more detail), but only in part.

Some very limited EM coverage employing the Crone JEM indicated two conductors at quite shallow depth. However, though they seem to occur at contacts, they bear little or no relationship to the geochem and thus are considered uninteresting. They are possibly due to barren pyrrhotite.

In summary, the magnetic trends, which are dominantly E-W suggest a series of E-W trending folds superimposed on a broader fold. These in turn are dislocated by N-E trending cross faults exhibiting a dominantly left-hand displacement.

Other than the observed influence of the N-E faults on the nickel pattern, nothing of prospecting interest seems to be revealed by the magnetics.

Bridesville West Group

At this writing, there is no detailed geology available to attempt to correlate with.

The portrayal of the interpretation is similar to that on the Old Nick sheet with a somewhat different orientation. Again a series of tight folds, trending northeasterly this time, are intersected by dominantly N-S trending faults.

However, there are two distinct departures from this pattern that are unexplained. These are:

(1) The round feature, likely an intrusive of acid composition occurring at about 800 N on line 12 E.

(2) The N-W trending magnetic feature at the north end of lines 20 and 24 E.

Supervised by:

G. W. H. Norman, P. Eng.

W. M. Dolan, M. Sc.,
Chief Geophysicist

DOMINION OF CANADA:)) Province of British Columbia.))) TO WIT:)	IN THE MATTER OF	Affidavit of Costs applicable for claim assessment on the Nickel Ridge Claim Group, November 1967 to March 1968.

I, J. A. Coope

of Newmont Mining Corporation of Canada Limited,
604 - 744 West Hastings Street,
Vancouver 1, B. C.

in the Province of British Columbia, do solemnly declare that

Nickel Ridge Claim Group costs applicable for claim assessment November 1967 to March 1968.

Bridesville W. Grid

Bulldozer trenching	256.00	
Geochemical analysis for Cu, Ni, and Zn - 2,525 determinations @ 60¢ each	1,515.00	
Soil sampling (February 1968)		
T. Blaine 10 man days @ $20 per man day		
L. Blaine 5 man days @ $20 per man day		
L. Gratto 10 man days @ $20 per man day		
M. Shorn 6 1/2 man days @ $20 per man day		
For a total of	630.00	
Line cutting (January 1968)		
T. Blaine 12 1/2 man days @ $20 per man day		
L. Gratto 12 1/2 man days @ $20 per man day		
For a total of	500.00	
Ground magnetometer survey - 9.93 line miles @ $50 per line mile - Operator - M. Johnson Interpretation - W. M. Dolan, February 1968	496.71	
		$3,397.71

Old Nick Grid

Geochemical analysis for Cu, Ni, and Zn 1,326 determinations @ 60¢ each	795.60
Soil sampling (November 1967)	
T. Blaine 9 man days @ $20 per man day	
L. Gratto 9 man days @ $20 per man day	
For a total of	360.00
Line cutting (November 1967)	
T. Blaine 7 man days @ $20 per man day	
L. Gratto 7 man days @ $20 per man day	
For a total of	280.00
Ground magnetometer survey - 9 line miles @ $50 per line mile - Operator - M. Johnson Interpretation - W. M. Dolan, February 1968	450.00

Bulldozer trenching	3,801.00	
Geological mapping (November 1967)		
C. P. Costin 25 man days @ $27.50 per man day	687.50	
Sampling, surveying (December 1967)		
S. W. Barclay 8 man days @ $32.20 per man day	257.60	
L. D. Westmacott 8 man days @ $20 per man day		
T. Blaine 8 man days @ $20 per man day		
L. Gratto 8 man days @ $20 per man day		
For a total of	480.00	
		$7,111.70

All Claims

Air magnetometer survey - 250 line miles @ $20 per line mile - Operator - F. P. DeMeyer, Interpretation - W. M. Dolan, February 1968	5,000.00	
Geochemical analysis for Cu, Ni, and Zn		
Stream samples @ 60¢ per determination	514.80	
Stream sediment sampling		
T. Blaine 6 man days @ $20 per man day		
L. Gratto 6 man days @ $20 per man day		
For a total of	240.00	
C. P. Costin - supervision		
65 man days @ $27.50 per man day	1,787.50	
J. A. Coope - supervision		
15 man days @ $100 per man day	1,500.00	
Transportation (Jeep from Redhawk Rentals Ltd.)	1,240.00	
		$10,282.30
GRAND TOTAL		$20,791.71

Nickel Ridge Claims Cost Break-down to specific claims

Old Nick Grid

Claim	Bulldozer Trenching	Geochem. Det.	Soil Sampling	Line Cutting	Magne-tometer	Mapping	Sampling Surveying	Total Claim
Old Nick 1	2492.	111.00	50.50		63.00	96.10	103.00	2,915.60
Old Nick 2	384.	99.30	45.00		56.20	86.00	92.00	762.50
Old Nick 3	--	45.60	20.70		25.80	39.40	42.30	173.80
Old Nick 4	76.	65.50	29.60		37.10	56.60	60.80	325.60
Old Nick 5	--	55.70	25.20		31.50	48.10	51.60	212.10
Old Nick 6	--	--	--	--	--	--	--	--
Old Nick 13	--	37.70	17.10		21.40	32.60	35.00	143.80
Old Nick 14	--	93.00	41.20		53.10	80.80	86.00	354.10
Old Nick 19	156.	95.20	43.20		54.00	82.50	88.30	519.20
Old Nick 20	693.	33.80	15.30		19.10	29.10	31.30	821.60
Old Nick E	--	49.60	22.50	70.00	28.10	43.00	46.00	259.20
Old Nick F	--	93.30	42.60	140.00	51.70	79.50	86.60	493.70
Old Nick G	--	15.90	7.10	70.00	9.00	13.80	14.70	130.50
Totals	$3801.	$795.60	$360.00	$280.00	$450.00	$687.50	$737.60	$7,111.70

Bridesville W. Grid

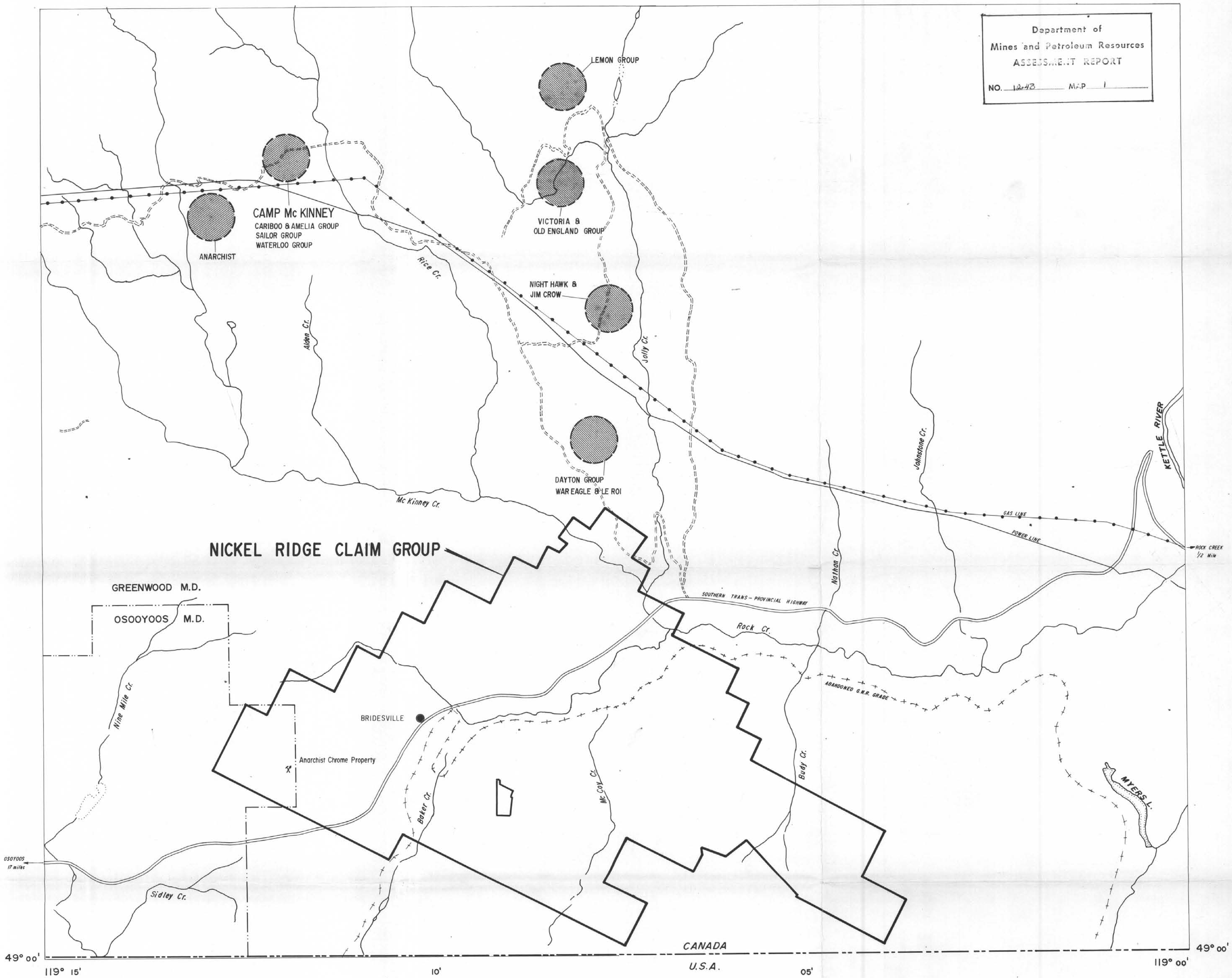
Claim	Bulldozer Trenching	Geochem. Det.	Soil Sampling	Line Cutting	Magne-tometer	Total Claim	
MB #2	256.00	95.00	42.22	33.35	38.90	465.47	
					Sub-total		$465.47
MB #1, 3, 4, 20, 21, 22, 30, 35, 103 Old Nick X104-X106	--	95.00 per claim	42.22 per claim	33.33 per claim	38.88 per claim	209.43 per claim	
					Sub-total		$2,513.14
MB #23, 36, 102 Old Nick X107	--	47.50 per claim	21.12 per claim	16.67 per claim	19.48 per claim	104.77 per claim	
					Sub-total		$419.08
					TOTAL		$3,397.71

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City of Vancouver, in the Province of British Columbia, this 15 day of May 1968, A.D.

A Commissioner for taking Affidavits within British Columbia or A Notary Public in and for the Province of British Columbia.

SUB - MINING RECORDER



NEWMONT MINING CORPORATION OF CANADA LTD.

LOCATION MAP
OF
NICKEL RIDGE CLAIM GROUP

BRIDESVILLE, B.C.

(49°02'N - 119°30'W - NAT. TOPO REF. 82 E/3-W)

MILE 1 1/2 0 1/2 1 MILE

DRAWN	CHECKED	MAY, 1968	FIG.- 1.

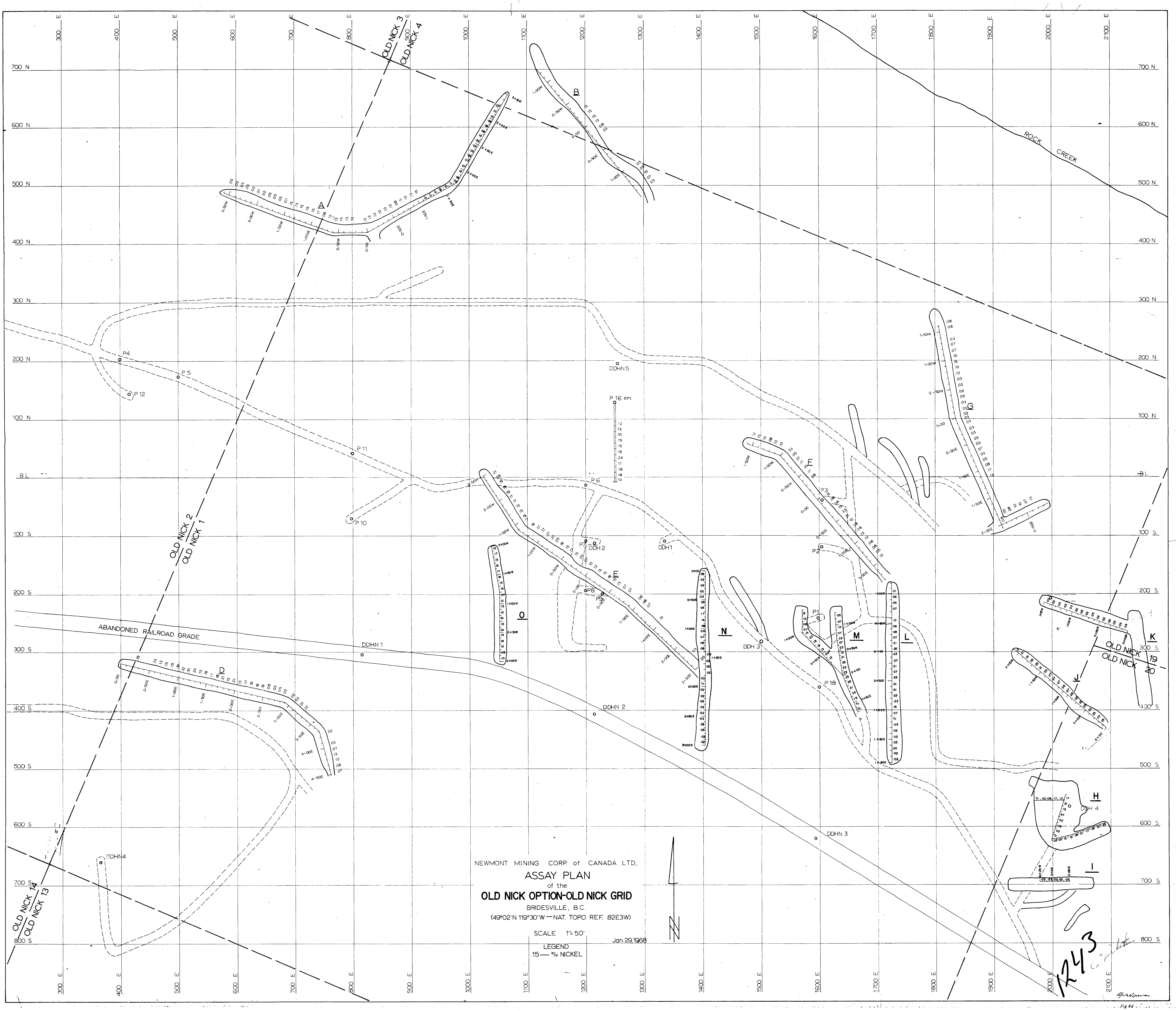
Altair Drafting Services Ltd.

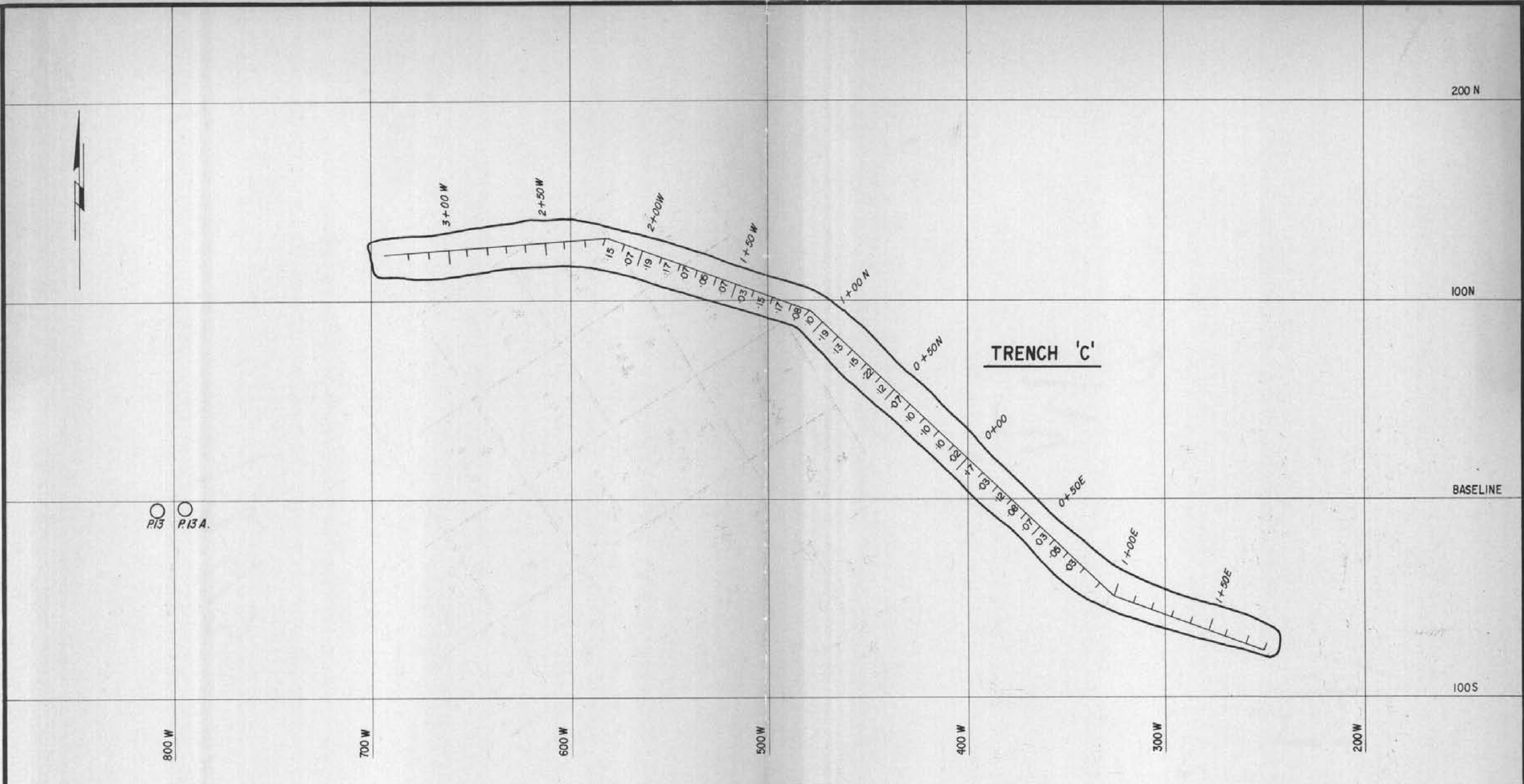
1243

CLAIMS & TOPOGRAPHY FROM MAP BY DEPARTMENT OF MINES & PETROLEUM RESOURCES, VICTORIA, B.C.

Jake
MB
X
A to R
No. 1 to 3
Old Nick
Lela Claims
Don Fraction
Lapsed
Outside Boundary
Fractions
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 2
SURVEYED CLAIM LOCATION
49°02 N – 119°30' W NTS 82 E 3W
1243
COPPER RIDGE MINES LTD.
VANCOUVER, B.C.
NICKEL RIDGE
PROPERTY
SCALE: 1 inch = 1000 Feet
DRG. No.
DRAWN BY: L. Davidson
TRACED BY:
DATE: Sept. 6, 1967
Fig 2

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 4
SOUTHERN TRANS - PROVINCIAL HIGHWAY
Rock Creek
ROCK CREEK BRIDGE
Baker Creek
Abandoned Great Northern Railway Grade
BASELINE
LINE 0
24W
20W
16W
12W
8W
4W
4E
8E
12E
16E
20E
24E
28E
32E
36E
40E
12N
8N
4N
4S
8S
12S
Breccia
Peridotite - dunite dyke float
Old Pits
GULLY
FLOAT
quartz diorite
DDH-N5
DDH-1
DDH-2
DDH-I
DDH-N2
DDH-N3
DDH N-4
LEGEND
UNIT (1) Interbedded meta shales & quartzites
UNIT (2) Pyrometasomatic quartzites & metashales
UNIT (3) Interbedded metashales & thin bedded quartzites
UNIT (4) Greenstone
Peridotite - dunite dykes
Quartzite
Biotitic quartzite
SYMBOLS
Contact (assumed)
Contact (defined)
Fault
DDH Diamond Drill Hole
P1 Percussion Hole
NEWMONT MINING CORPORATION OF CANADA LTD
GEOLOGICAL MAP
OF THE
OLD NICK OPTION
OLD NICK GRID
BRIDESVILLE, B.C.
(49°02'N - 119°30'W - NAT. TOPO. REF. 82E/3-W)
SCALE
Feet 0 200 400 600 800 Feet
DRAWN: H.W.C.
CHECKED
MAY, 1968
FIG-3
Altair Drafting Services Ltd.
1243


NEWMONT MINING CORP. of CANADA LTD.
ASSAY PLAN
of the
OLD NICK OPTION-OLD NICK GRID
BRIDESVILLE, B.C.
(49°02'N 119°30'W — NAT. TOPO REF. 82E3W)
SCALE 1"= 50'
Jan. 29, 1968
LEGEND
.15 — % NICKEL
ROCK CREEK
ABANDONED RAILROAD GRADE
OLD NICK 3
OLD NICK 4
OLD NICK 2
OLD NICK 1
OLD NICK 14
OLD NICK 13
OLD NICK 19
OLD NICK 20
DDHN 1
DDHN 2
DDHN 3
DDHN4
DDHN 5
DDH 1
DDH 2
DDH 3
DDH 4
P 16
BL
1243



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 3

Legend.
·15 — DENOTES NICKEL (%)

1243

NEWMONT MINING CORPORATION OF CANADA LTD.

ASSAY PLAN (NICKEL)

OF THE

OLD NICK OPTION-OLD NICK GRID

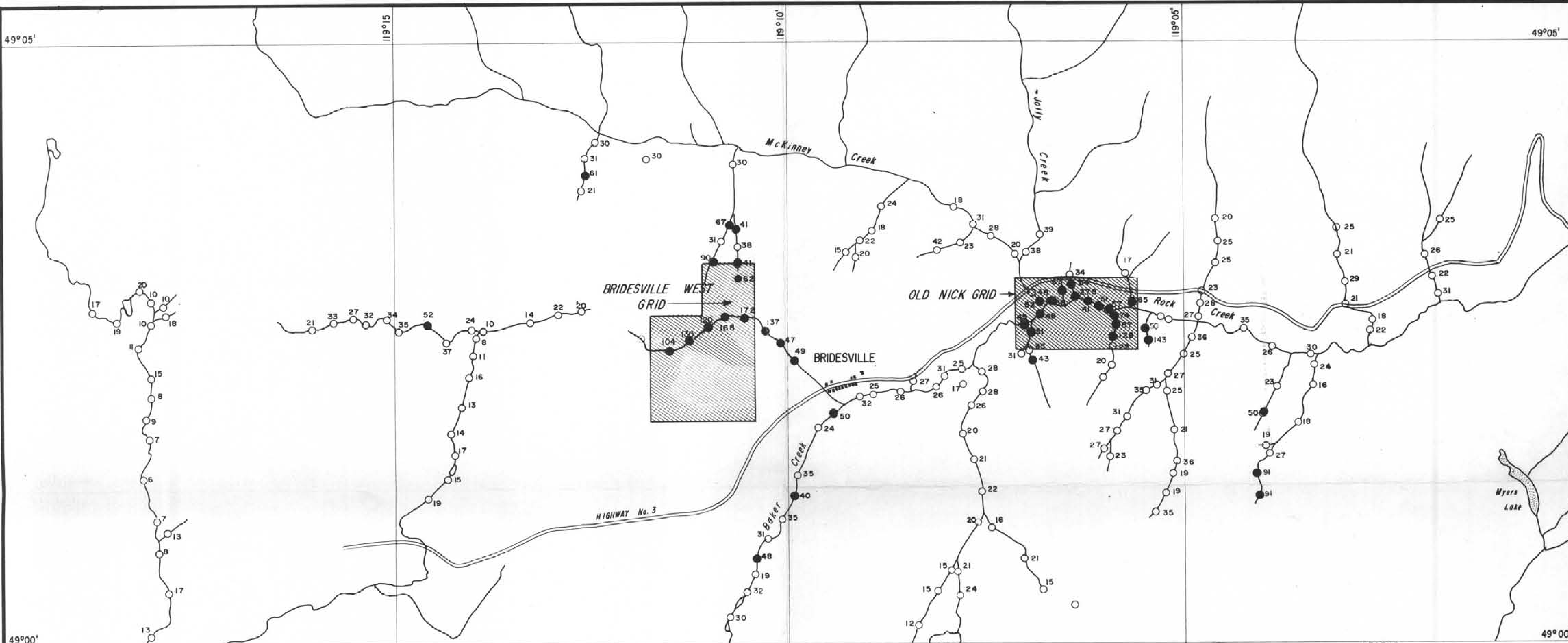
BRIDESVILLE, B.C.

(49°02'N 119°30'W — NAT. TOPO. REF. 82E3W.)

SCALE : 1" = 50'   APRIL, 1968.

Fig 4b

Altair Drafting Services Ltd.



1243

LEGEND

MINUS 80 MESH FRACTION ANALYSED VALUES IN PPM

○ Geochemical Sample Location

● 40 ppm +

TOTAL NICKEL

NEWMONT MINING CORPORATION OF CANADA LTD.

RECONNAISSANCE GEOCHEMICAL SURVEY OF THE NICKEL RIDGE CLAIM GROUP

BRIDESVILLE, B.C.

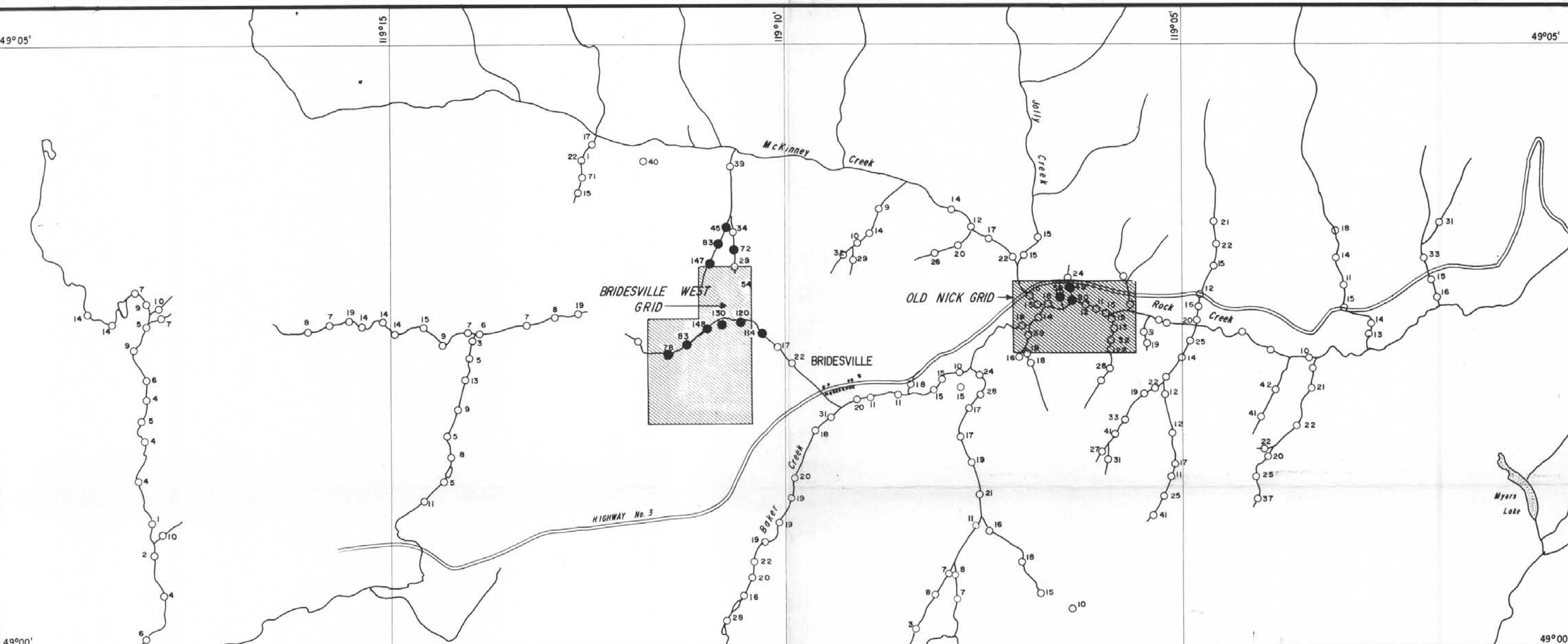
(49°02'N – 119°30'W – NAT. TOPO REF. 82 E/3-W)

SCALE : 1" = 50,000

MILE 1 0 1 MILE

DRAWN : H.W.C.	CHECKED :	MAY, 1968	FIG. — 5

Altair Drafting Services Ltd.



1243

LEGEND

MINUS 80 MESH FRACTION ANALYSED, VALUES IN PPM

○ Geochemical Sample Location

● 45 ppm +

TOTAL COPPER

NEWMONT MINING CORPORATION OF CANADA LTD.

RECONNAISSANCE GEOCHEMICAL SURVEY OF THE NICKEL RIDGE CLAIM GROUP

BRIDESVILLE, B.C.

(49°02'N – 119°30'W – NAT. TOPO REF. 82 E/3-W)

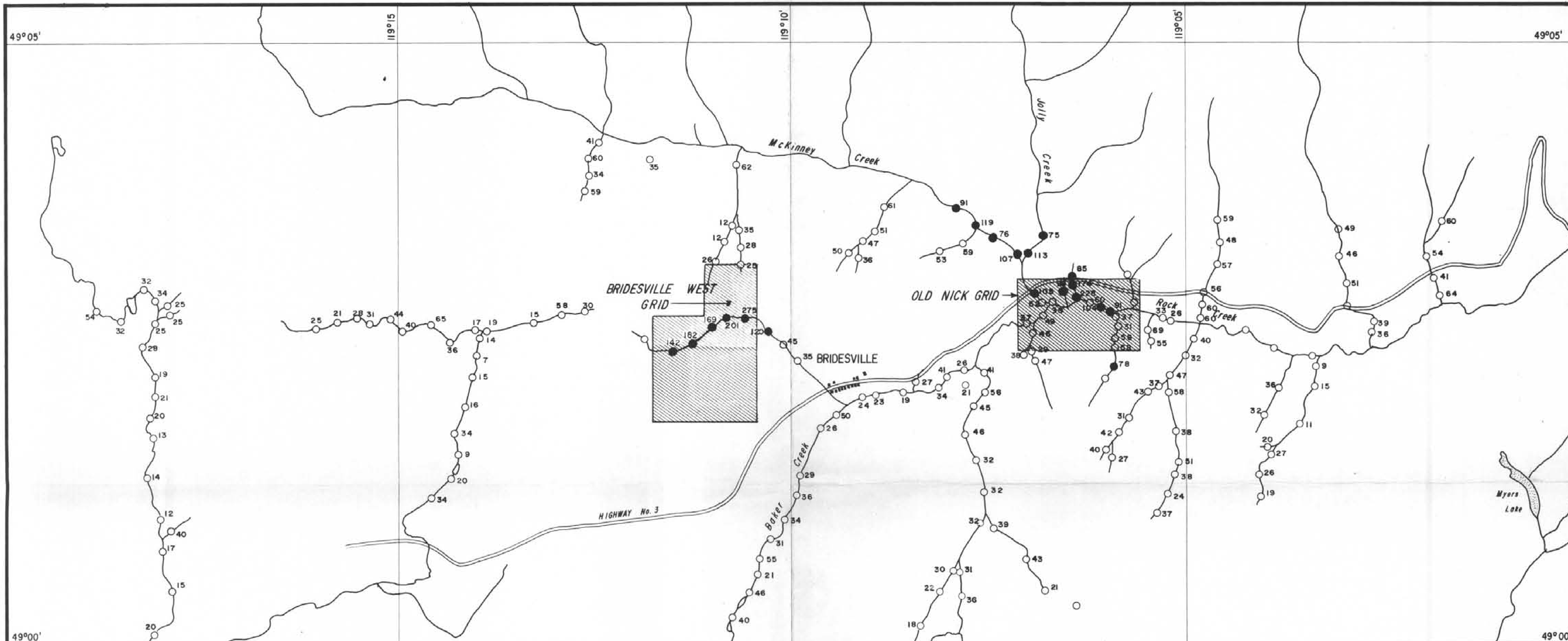
SCALE : 1" = 50,000

MILE 1 0 1 MILE

DRAWN : H.W.C.	CHECKED :	MAY, 1968	FIG. — 6

Altair Drafting Services Ltd.

J. Alan Coope



1243

LEGEND

MINUS 80 MESH FRACTION ANALYSED VALUES IN PPM

○ Geochemical Sample Location

● 70 ppm +

TOTAL ZINC

NEWMONT MINING CORPORATION OF CANADA LTD.

RECONNAISSANCE GEOCHEMICAL SURVEY

OF THE

NICKEL RIDGE CLAIM GROUP

BRIDESVILLE, B.C.

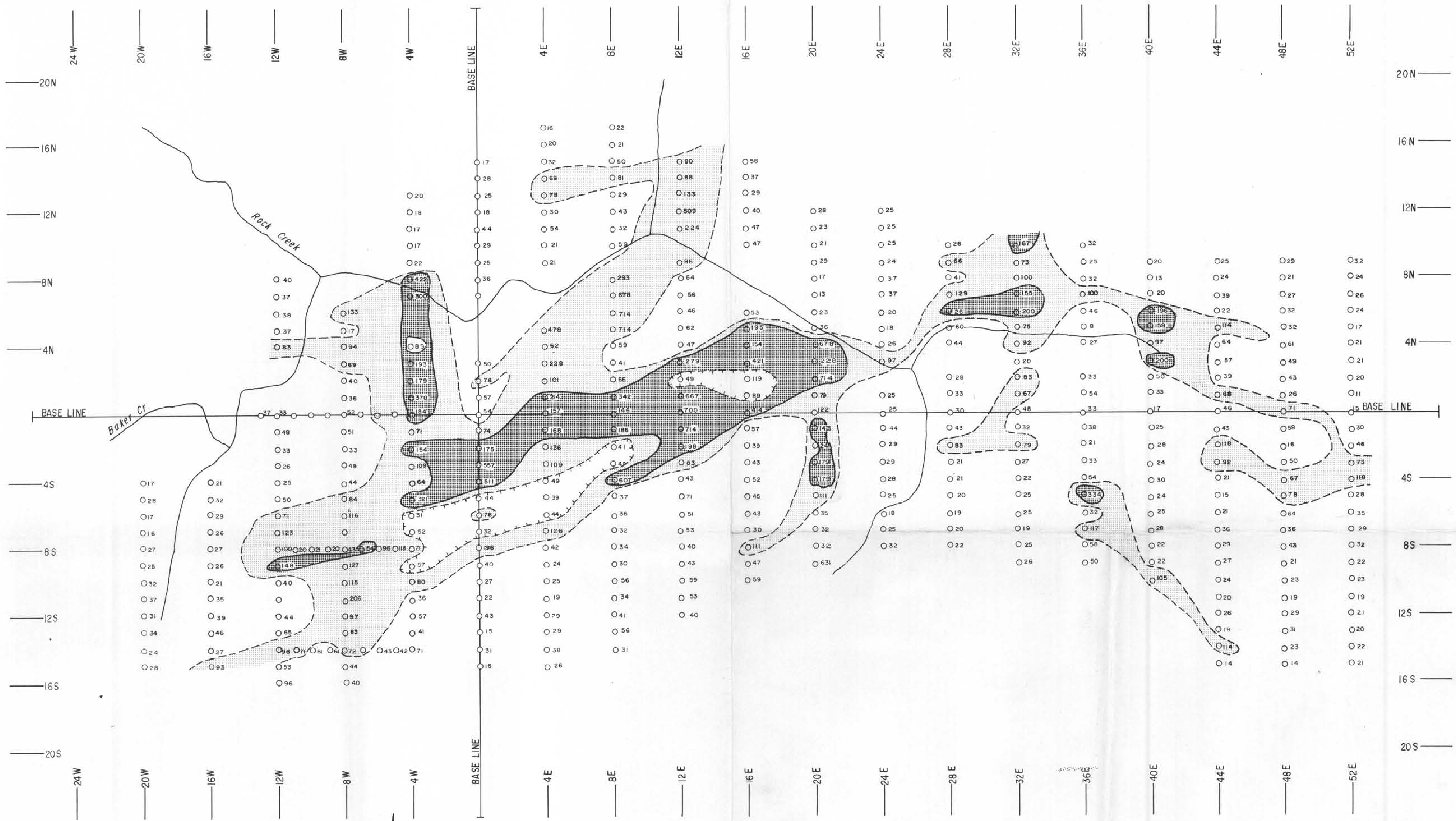
(49°02'N — 119°30'W — NAT. TOPO REF. 82 E/3-W)

SCALE : 1" = 50,000

MILE 1 0 1 MILE

DRAWN : H.W.C.	CHECKED :	MAY, 1968	FIG. — 7

Altair Drafting Services Ltd.



LEGEND

MINUS 80 MESH FRACTION ANALYSED VALUES IN P.P.M.
SAMPLE DEPTH 30"

65 – 139 p.p.m. Ni.

140+ p.p.m. Ni.

1243

TOTAL NICKEL

NEWMONT MINING CORPORATION OF CANADA LTD.

GEOCHEMICAL SOIL SURVEY

OF THE

OLD NICK OPTION

OLD NICK GRID
BRIDESVILLE B.C.

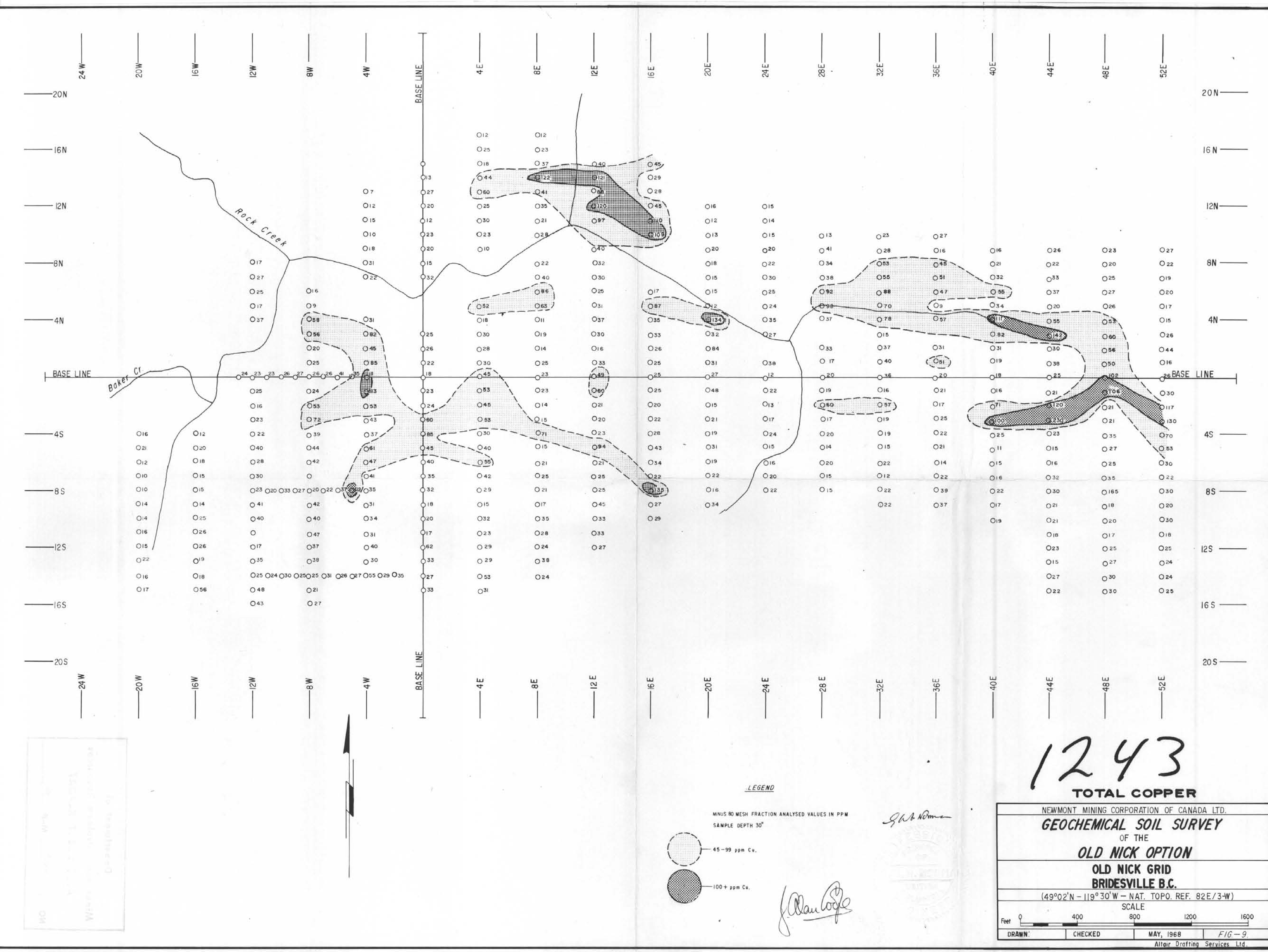
(49°02'N – 119°30'W – NAT. TOPO. REF. 82E/3-W)

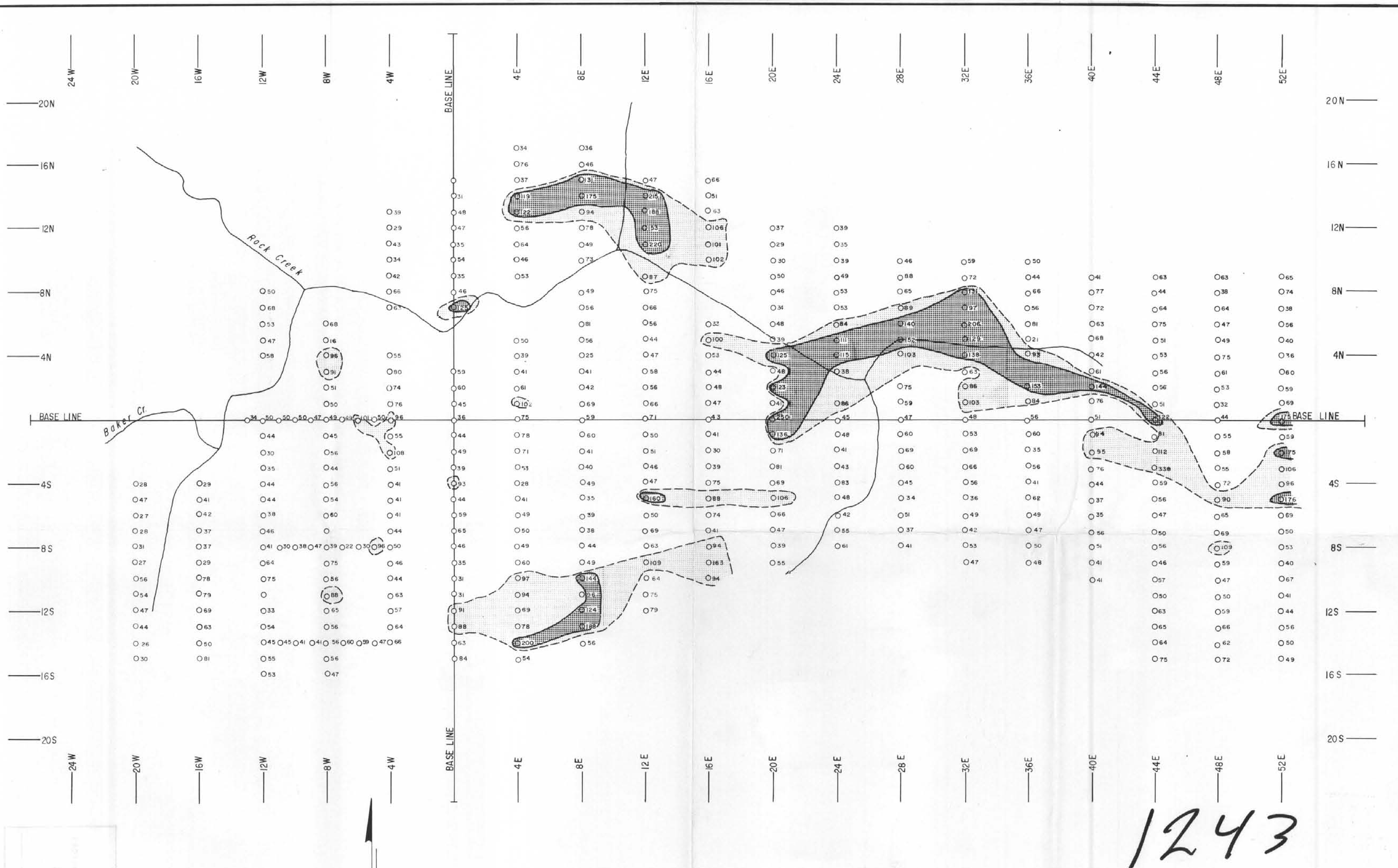
SCALE

Feet 0 400 800 1200 1600

DRAWN:	CHECKED	MAY, 1968	FIG – 8

Altair Drafting Services Ltd.


24W
20W
16W
12W
8W
4W
BASE LINE
4E
8E
12E
16E
20E
24E
28E
32E
36E
40E
44E
48E
52E
20N
16N
12N
8N
4N
4S
8S
12S
16S
20S
Rock Creek
Baker Cr.
LEGEND
MINUS 80 MESH FRACTION ANALYSED VALUES IN PPM
SAMPLE DEPTH 30"
45-99 ppm Cu.
100+ ppm Cu.
1243
TOTAL COPPER
NEWMONT MINING CORPORATION OF CANADA LTD.
GEOCHEMICAL SOIL SURVEY
OF THE
OLD NICK OPTION
OLD NICK GRID
BRIDESVILLE B.C.
(49°02'N - 119°30'W - NAT. TOPO. REF. 82E/3-W)
SCALE
Feet 0 400 800 1200 1600
DRAWN:
CHECKED
MAY, 1968
FIG-9
Altair Drafting Services Ltd.



1243

TOTAL ZINC

NEWMONT MINING CORPORATION OF CANADA LTD.

GEOCHEMICAL SOIL SURVEY

OF THE

OLD NICK OPTION

OLD NICK GRID

BRIDESVILLE B.C.

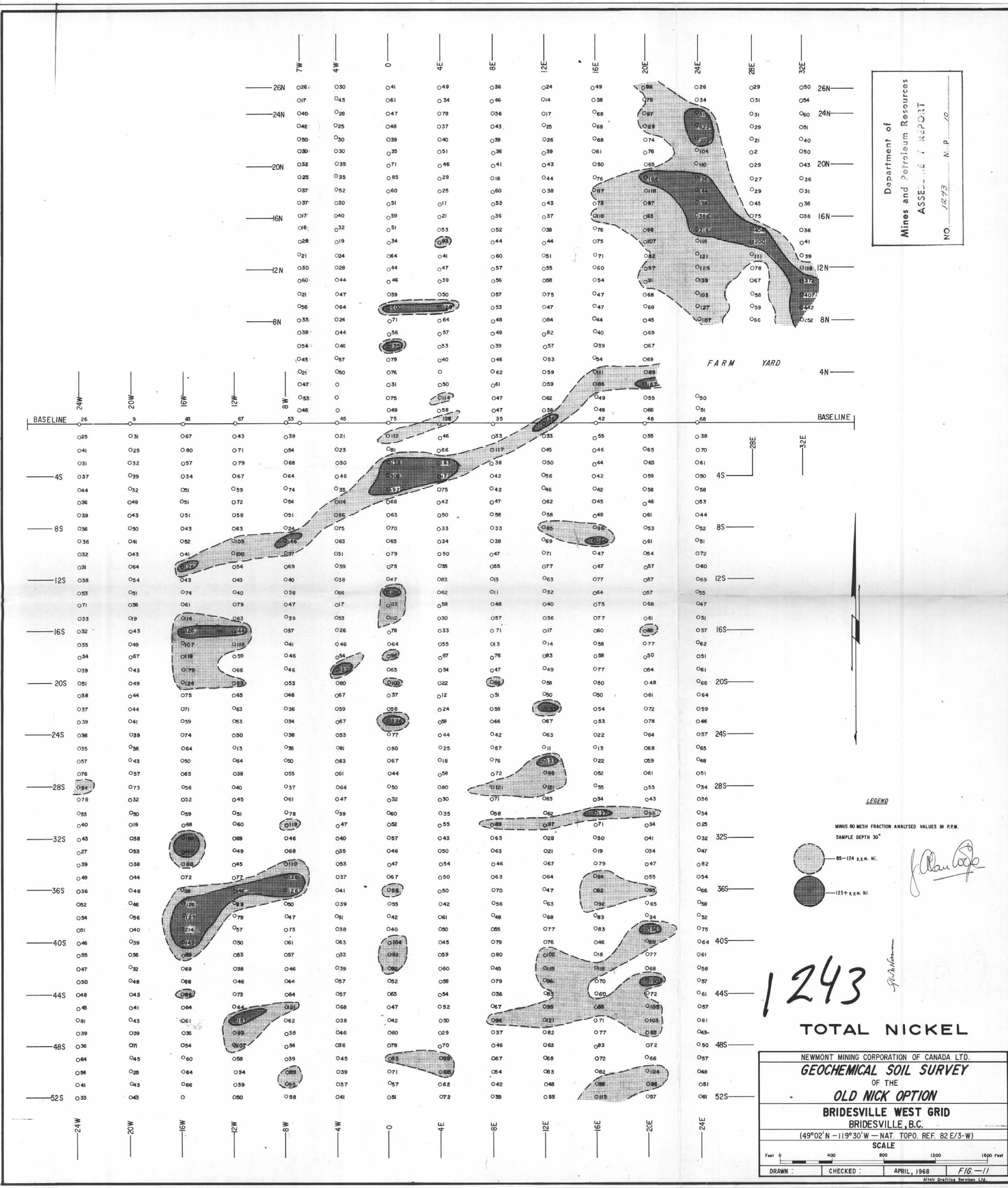
(49°02'N - 119°30'W - NAT. TOPO. REF. 82E/3-W)

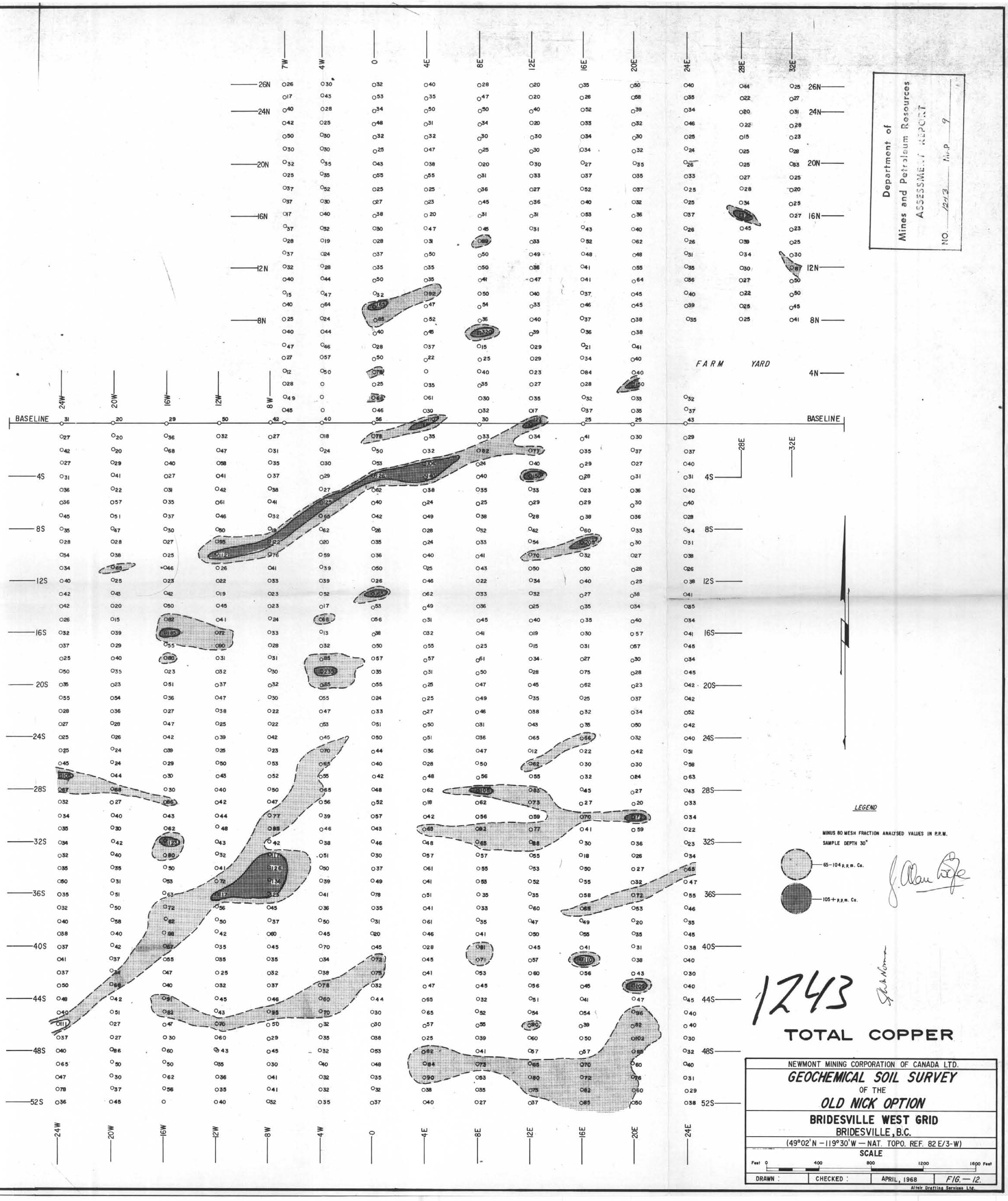
SCALE

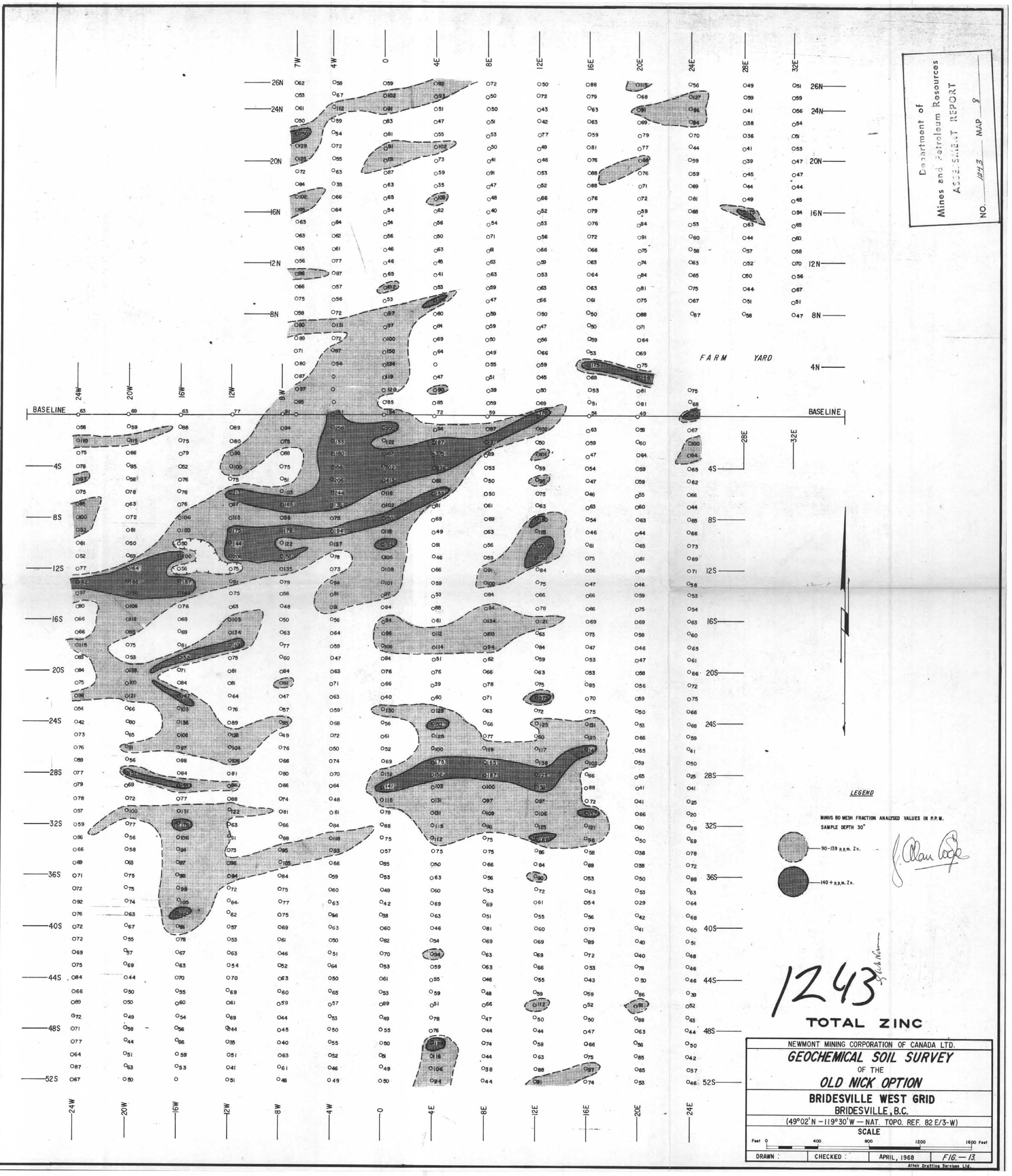
Feet 0 400 800 1200 1600

DRAWN:	CHECKED	MAY, 1968	FIG-10

Altair Drafting Services Ltd.

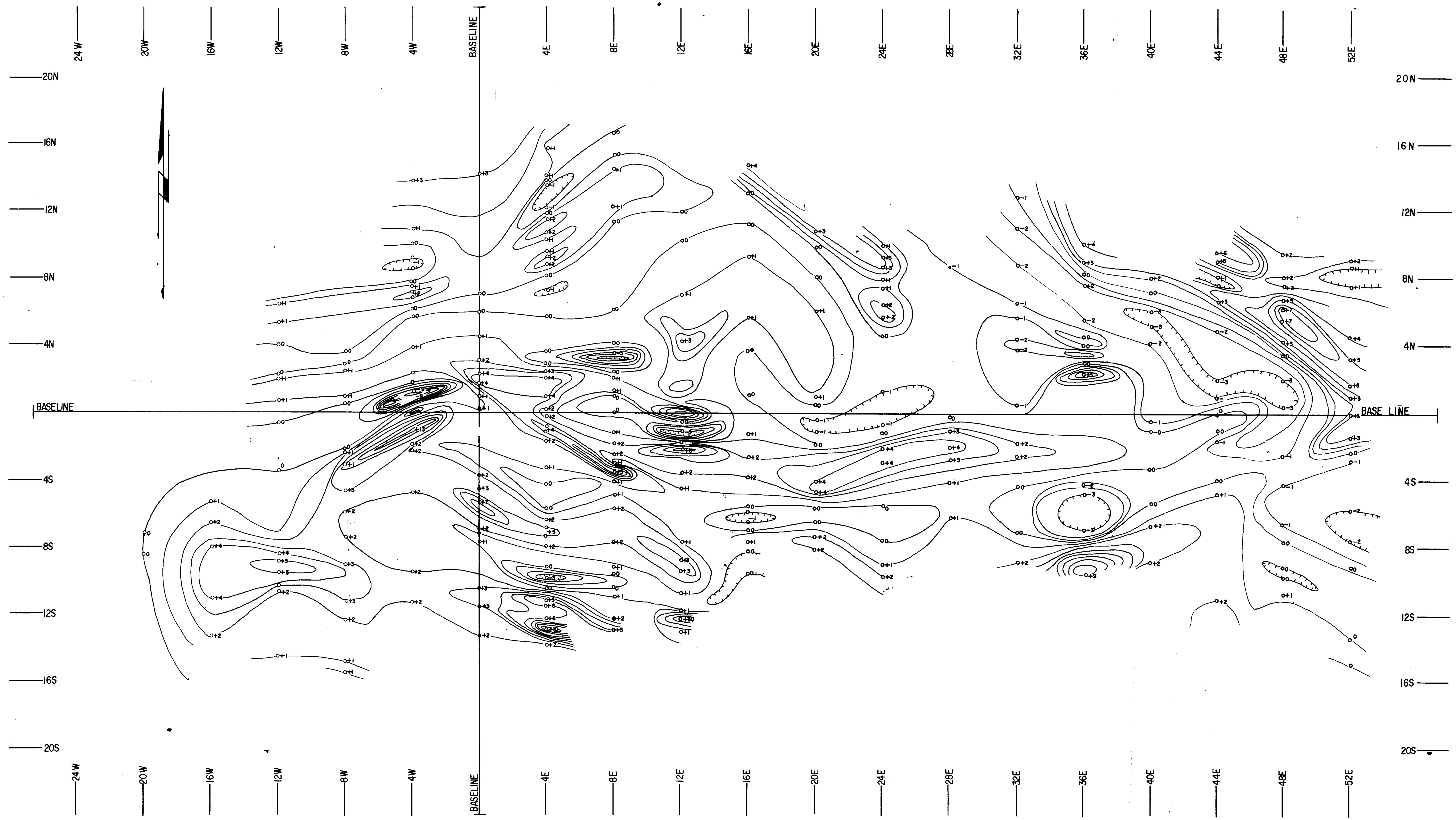

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 10
FARM YARD
BASELINE
LEGEND
MINUS 80 MESH FRACTION ANALYSED VALUES IN P.P.M.
SAMPLE DEPTH 30"
85—124 p.p.m. Ni.
125+ p.p.m. Ni
1243
TOTAL NICKEL
NEWMONT MINING CORPORATION OF CANADA LTD.
GEOCHEMICAL SOIL SURVEY
OF THE
OLD NICK OPTION
BRIDESVILLE WEST GRID
BRIDESVILLE, B.C.
(49°02'N – 119°30'W — NAT. TOPO. REF. 82 E/3-W)
SCALE
Feet 0 400 800 1200 1600 Feet
DRAWN :
CHECKED :
APRIL, 1968
FIG. — 11
Altair Drafting Services Ltd.


Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 9
FARM YARD
BASELINE
LEGEND
MINUS 80 MESH FRACTION ANALYSED VALUES IN P.P.M.
SAMPLE DEPTH 30"
65-104 p.p.m. Cu.
105+ p.p.m. Cu.
1243
TOTAL COPPER
NEWMONT MINING CORPORATION OF CANADA LTD.
GEOCHEMICAL SOIL SURVEY
OF THE
OLD NICK OPTION
BRIDESVILLE WEST GRID
BRIDESVILLE, B.C.
(49°02'N - 119°30'W - NAT. TOPO. REF. 82 E/3-W)
SCALE
Feet 0 400 800 1200 1600 Feet
DRAWN :
CHECKED :
APRIL, 1968
FIG. - 12.
Altair Drafting Services Ltd.



Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 8
FARM YARD
BASELINE
LEGEND
MINUS 80 MESH FRACTION ANALYSED VALUES IN P.P.M.
SAMPLE DEPTH 30"
90-139 p.p.m. Zn.
140 + p.p.m. Zn.
1243
TOTAL ZINC
NEWMONT MINING CORPORATION OF CANADA LTD.
GEOCHEMICAL SOIL SURVEY
OF THE
OLD NICK OPTION
BRIDESVILLE WEST GRID
BRIDESVILLE, B.C.
(49°02'N – 119°30'W — NAT. TOPO. REF. 82 E/3-W)
SCALE
Feet 0 400 800 1200 1600 Feet
DRAWN : CHECKED : APRIL, 1968 FIG. — 13.
Altair Drafting Services Ltd.

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243 MAP 14
OLD NICK GROUP
SUSPECTED INTRUSIVE AT DEPTH
BRIDESVILLE
119°10'
119°05'
49°00'
LEGEND
Magnetic contour lines
Flight lines & fiducials
River
Roads
+13 Photo centre
Suspected fault
Differentiated Intrusive
Anarchist metasediments
Volcanics
Nelson intrusives
Greenstones
N.B. — Areas not shaded represent non-magnetic Anarchist metasediments or areas of variable magnetics
1243
NEWMONT MINING CORPORATION OF CANADA LTD.
AIRBORNE MAGNETOMETER SURVEY
of the
NICKEL RIDGE CLAIM GROUP
BRIDESVILLE, B.C
(49°02'N – 119°30'W – NAT. TOPO. REF. 82 E/3-W)
SCALE : 1" = 1320' approx. (Overlay to Airphotos)
DRAWN : M.K.
CHECKED :
MAY, 1968
FIG. – 14
Altair Drafting Services Ltd.



1243

LOGISTICS

MAGNETOMETER — Sharpe MF — 1.

STATION INTERVAL — 50'

LINE INTERVAL — 400'

LINE ORIENTATION — N.—S.

OPERATOR — Martin Johnson

15 CONTOUR & INTERPRETATION — W.M. DOLLAN

LEGEND:

CONTOUR INTERVAL = 100 gammas; i.e. +8 = 800 gammas

NEWMONT MINING CORPORATION OF CANADA LTD.

MAGNETOMETER SURVEY

OF THE

OLD NICK OPTION

OLD NICK GRID

BRIDESVILLE, B.C.

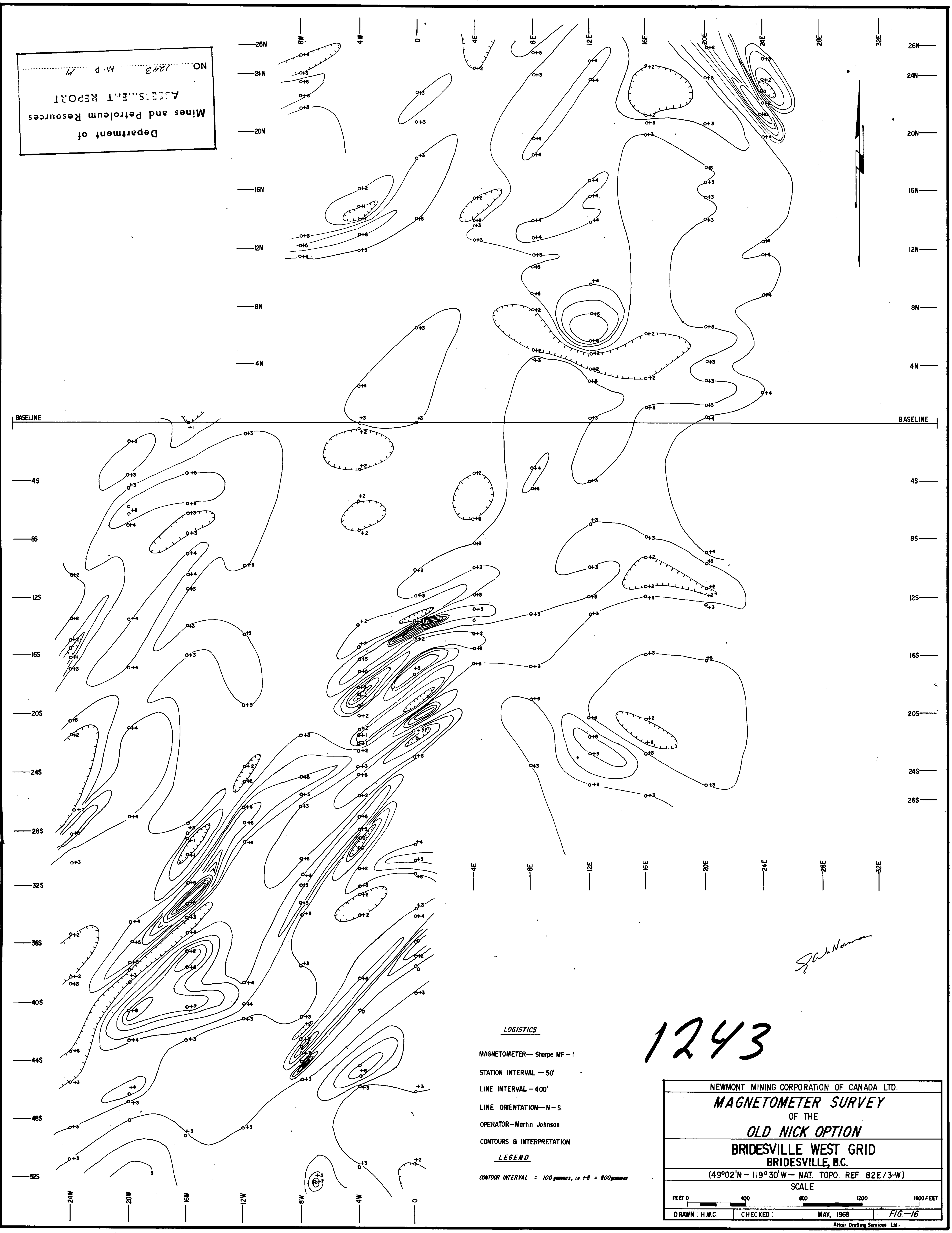
(49°02'N – 119°30'W – NAT. TOPO. REF. 82E/3 W)

SCALE

Feet 0 400 800 1200 1600 Feet

DRAWN: H.W.C.	CHECKED:	MAY, 1968	*FIG.–15*

Altair Drafting Services Ltd.



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1243
1243
LOGISTICS
MAGNETOMETER— Sharpe MF-I
STATION INTERVAL — 50'
LINE INTERVAL — 400'
LINE ORIENTATION — N.-S.
OPERATOR — Martin Johnson
CONTOURS & INTERPRETATION
LEGEND
CONTOUR INTERVAL = 100 gammas, i.e. +8 = 800 gammas
NEWMONT MINING CORPORATION OF CANADA LTD.
MAGNETOMETER SURVEY
OF THE
OLD NICK OPTION
BRIDESVILLE WEST GRID
BRIDESVILLE, B.C.
(49°02'N – 119°30'W – NAT. TOPO. REF. 82E/3-W)
SCALE
FEET 0 400 800 1200 1600 FEET
DRAWN: H.W.C.
CHECKED:
MAY, 1968
FIG.—16
Altair Drafting Services Ltd.
BASELINE