## AND GEOPHYSICAL REPORT

ON THE
MEMES PROPERTY

Omineca Mining Division
British Columbia

Claim Name: NEW KEMESS No. 1 Record No. 43 NEW KEMESS No. 244

Latitude: $57^{\circ}$ L4' North $\quad$ Longitude: $126^{\circ}$ West $03^{\prime} 48^{\prime \prime}$

$$
\text { N.T.S. } 94 \text { E/2W, LE }
$$



Suite 510-800 West Hastings Street Vancouver, B. C. V6C 2V6
(604) 684-2710

Owner: Kennco Explorations (Western) eta.

- prepared by -
minored consulting ltd.
Suite 200A - 156 Victoria Street
Kamloops, B.C. V2C 127
(604) 372-2181

FILMED
J. D. Blanchflower, F.G.A.C. Consulting Geologist

## TABLE OF CONTENTS

## Page No.

INTRODUCTION ..... 1
SUMMARY AND RECDMMENDATIONS ..... 1
GENEAAL DESCRIPTION ..... 5
Location and Access ..... 5
Property and Dwnership ..... 5
Physiography ..... 7
History ..... 7
GEDLOGIC SETTING ..... 8
DISCUSSION OF PREVIOUS EXPLDRATIDN RESULTS ..... 16
1986 EXPLORATIDN PROGRAMME ..... 18
Survey Control Grid ..... 18
Prospecting ..... 19
Geochemical Surveys ..... 20
Soil Geochemical Survey ..... 20
Lithogeochemical Survey ..... 21
Geophysical Survey ..... 21
Proton Magnetometer Survey ..... 21
RESULTS OF THE 1986 EXPLORATION PROGRAMME ..... 22
Prospecting ..... 22
Lithology ..... 22
Structure ..... 25
Alteration ..... 27
Mineralization ..... 28
Geochemical Surveys ..... 28
Soil Geochemical Survey ..... 28

## TABLE OF CONTENTS (Continued)

Page No.
Lithogeochemical Survey ..... 31
Geophysical Survey ..... 31
Proton Magnetometer Survey ..... 31
DISCUSSION OF THE EXPLQRATION AESULTS ..... 32
EXPLORATION POTENTIAL ..... 32
CONCLUSIONS ..... 33
COST ESTIMATES ..... 34
STATEMENTS DF QUALIFICATIONS ..... 35
日IBLIOGRAPHY ..... 37

## APPENDICES

| APPENDIX | I : | Acme Analytical Laboratories Ltd. Certificate of Analysis - Soil Samples |
| :---: | :---: | :---: |
| APPENDIX | II: | Acme Analytical Laboratories Ltd. Certificate of Analysis - Rock Samples |
| APPENDIX | III: | Geostatistics for the 1986 Soil Geochemical Survey |
| APPENDIX | IV: | Geostatistics for the 1986 Lithogeochemical Survey |
| APPENDIX | $V:$ | Getty Mines, Limited 1976 Drill Logs and Assay Summaries |
| APPENDIX | VI: | Lithogeachemical Sample Descriptions |
| APPENDIX | VII: | Geophysical Instrument Specifications |

## LIST DF ILLUSTRATIONS

Figure No.
Page No.

1

2

3

4

5

6

7

Location Map, $1: 10,000,000$ 2

Claim Map, $1: 50,000$ 6

3 Regional Geology Map, 1 : 125,000........... 9
4 Table of Formations for the Toodoggone District 13

5 Property Geology Map, 1 : 14,400............ 17
Geological and Lithogeochemical Plan, 1 : 2,500

In Pooket
Geochemical Plan, Soil Geochemistry, Gold (p.p.b.), 1 : 2,500............... In Pocket

Geachemical Plan, Soil Geochemistry, Gilver (P.P.m.), 1 : 2,500............. In Pocket

Geochemical Plan, Soil Geochemistry, Copper (p.p.m.), 1 : 2,500............. In pocket

Geochemical Plan, Soil Geochemistry, Zinc (p.p.m.), 1 : 2,500

In Pocket
Geochemical Plan, Soil Geochemistry, Molybdenum (P.P.m.), 1 : 2,500......... In Pocket

Geochemical Plan, Soil Geochemistry, Arsenic (p.p.m.), 1 : 2,s00............ In Pocket

Geophysical Plan, Ground Magnetics, 1 : 2,500

In Pocket
Compilation Plan, 1 : 2,500. In Pocket

## INTRODUCTION

El Condor Resources Ltd. of Suite 510-800 West Hastings Street, Vancouver, B.C. operates the KEMESS property. This property is comprised of two M.G.S. mineral claims, totalling 38 units; all situated in the Omineca Mining Division of British Columbia.

This report, prepared at the request of the directors of $E l$ Condor Resources Ltd., describes the geologic setting, history, 1986 exploration results and potential of the property. An exploration programme is recommended with cost estimates.

During the 1986 field season the writer supervised an exploration programme which included: establishment of a survey control grid ( 14.1 line-km.), prospecting (1:2,500), relogging and resampling of diamond drill core ( 147 core samples), soil geochemical sampling ( 351 samples), surface lithogeochemical sampling (33 samples), and geophysical surveying (ground magnetics).

The writer wrote this report which documents the results of the 1986 programme, and the results of previous exploration work by Kennco Explorations, (Western) Limited ( 1966 to 1971) and Getty Mines, Limited (1975 to 1976).

## SUMMARY AND RECOMMENDATIONS

The KEMESS property is situated 7 Kilometres east of Thutade Lake and 3.5 kilometres south of Antycelley Creek, 265 kilometres north of Smithers or 425 kilometres northwest of Prince George, in northcentral British Columbia. . Its geographic coordinates are $57^{\circ} 04^{\prime}$ North latitude by $126^{\circ} 44^{\prime}$ West longitude (N.T.S.94E/2).

Access is possible by fixed-wing aircraft from Smithers to the Sturdee airstrip which services the Baker (Chapelle) Mine and much of the Toodoggone area. It is approximately 265 kilometres from Smithers to the Sturdee gravel airstrip; thence, 26 kilometres southeastward by helicopter to the property.

All interests in the claims are owned by Kennco Explorations, (Western) Limited of Vancouver, Eritish Columbia. El Condor Resources Ltd. has negotiated an option agreement with the property owner, and will operate the property in fulfillment its term.

The claims cover the north-facing slopes and highlands east of Duncan Lake. These highlands are part of the Omineca Mountains of the Swannell Range. Elevations in the claims range from 1,400 metres ( 4,593 feet) to 1,932 metres ( 6,339 feet) A.M.S.L.


## - SCALE - <br> 1 10,000,000



To accompany a report by J.D. Elanchiflower.

| minorex consurting lid. <br>  |  |
| :---: | :---: |
| EL CONDOR RESOURCES LTD. VANCOUVER, BRITISH COLUMBIA |  |
| LOCATI <br> KEMESS OMINECA MIN | N MAP PROPERTY NG DIVISION,B.C. |
| OATE: NOVEMBER,1986 | SCALEt AS SHOWN |
| DWN.IT: $T . Q . /$ T. | OW6.ल०: 1 |

In 1966, Kennco Explorations (Western) Limited carried out a regional silt geochemical survey of the region. The following year Kennco staked 100 mineral claims covering the Kemess gossan. In 1968, their exploration work included: silt, sail and rock geochemical sampling, geological mapping (1:9,600), and X-ray diamond drilling, which totalled 51 metres (168 feet) for two holes. Subgequent drilling by Kennco inciuded four X-ray holes totalling 127 metres (4i8 feet) in 1969, and two X-ray holes totalling 54 metres ( 178 feet) in 1971.

Getty Mines Ltd. optioned the property-in 1975. Their initial exploration work included: photogrammetric topographic mapping (1:4,800), relocation of the mineral claims, 'fill-in' soil geochemical sampling, geological mapping ( $1: 4,800$ ), and diamond drilling ( 5 NQ and $B Q$ holes totalling 589 metres or 1,932 feet). In 1976 Getty diamond drilled seven $N Q$-and $日 Q-c o r e$ holes totalling 1,476 metres (4,842 feet).

The property is largely underlain by intercalated, basaltic to andesitic flows and volcaniclastics belonging to the Savage Mountain Formation of the Upper Triassic Takla Group. Porphyritic stooks and dykes, comagmatic with an underlying granitic pluton, intrude the roof pendant of volcanic rocks.

The 1986 exploration programme was directed toward evaluating the precious-metal potential of the property. The field work included: the establishment of a survey control grid (14.1 line-km.), prospecting (1:2,500, 4 square km.), relogging and resampling of diamond drill core ( 147 core samples), soil geochemical sampling ( 351 samples), surface lithogeochemical sampling (33 samples), and geophysical surveying (ground magnetics, 14.1 line-km.). This programme was carried out over a 16-day period from September 3 to 18, 1986.

The exploration results are very encouraging. The geochemical results indicate that there are highly anomalous gold and silver values spatially, and possibly genetically, associated with a large structurally controlled zone of intense hydrothermal alteration in a poorly explored area of the property. The known copper, molybdenum and minor precious-metal mineralization occurs within an area of propylitically-altered volcanics, west of the most intense hydrothermal alteration.

There seams to be two types of mineralization. The first type is the fracture controlled and disseminated copper and molybdenum mineralization of the Central and West Cirque areas. This mineralization has been sparingly tested by two operators. The grades of the known mineralization appear to be subeconomic at current metal prices. The second type is gold-and gilverbearing sulphide mineralization. It appears to be spatially and genetically related to an intense hydrothermal alteration zone which is centred in the East Cirque area. This second type of mineralization requires detailed exploration.

It is the writer's opinion that further exploration is definitely warranted for the following reasons.

1. The property is located within one of the most interesting and active exploration camps in the province.
2. The alteration and mineralization are spatially, and probably genetically, related to calc-alkaline stocks and dykes that have intruded a roof pendant of Takla Group volcanics. This setting is very similar to a number of known coppermolybdenum and gold-copper deposits.
3. Past exploration attempted to test the porphyry coppermolybdenum mineralization but ignored, or did not recognize, the precious-metal potential of this property.
4. The quartz-sericite-pyrite alteration zone at the East Cirque has been mapped for 700 metres in an east-northeasterly direction and 500 metres in a north-northwesterly direction.
5. A 300- by 200-metre coincident gold and molybdenum soil geochemical anomaly is situated along the exposed western edge of the quartz-sericite-pyrite alteration zone.
6. Surface lithogeochemical samples within the gold and molyodenum soil anomaly all show elevated gold and silver values.

The following work is recommended to test the precious-metal potential of this property.

1. Conduct an electromagnetics (VLF-EM) and induced polarization (time domain, dipole-dipole) survey of the control grid to delineate any structures which may control the precious metal-bearing sulphide mineralization.
2. Test the exploration results with diamond drilling.
3. Contingent upon the success of the above, define the mineralization with diamond drilling for a pre-feasibility study.

The total cost of this work is estimated to be $\$ 300,000.00 ;$ $\$ 100,000.00$ for the first stage work and $\$ 200,000.00$ for the second stage drilling.

## general deschiption

## Location and Access

The property is situated 7 kilometres east of Thutade Lake and 3.5 Kilometres south of Antycelley Creek; 265 kilometres north of Smithers or 425 kilometres northwest of Prince George, in northcentral British Columbia. Its geographic coordinates are $57^{\circ} 04^{\prime}$ North latitude by $126^{\circ} 44^{\prime}$. West longitude (N.T.S.94E/2).

Access is possible by fixed-wing aircraft from Smithers to the Sturdee airstrip which services much of the Toodoggone area and the Baker (Chapelle) Mine. It is approximately 265 kilometres from Smithers to the Sturdee airstrip and 26 kilometres by helicopter from this gravel airstrip to the property. Alternatively, one can drive from Fort 5 . James north to Johansen Lake, a distance of 400 kilometres on the 'Mining Development' road. From Johansen Lake, it is approximately 70 kilometres north by helicopter to the property. In addition, the British Columbia Railway right of way passes 72 kilometres south of the property.

Float plane access to Duncan Lake, from either Smithers or Johansen Lake, and then hiking to the property is most difficult because there is 1,300 feet of relief and thick vegetation between the lake and the centre of the property.

## Property and Ownership

The property is located in the Dmineca Mining Division of northcentral Eritish Columbia. It is comprised of two M.G.S. mineral claims, totalling 38 units. The configuration of the claim group is shown on figure 2. All pertinent claim data are summarized in the following table.

| Claim <br> Name | Record <br> No. | Units | Record <br> Date | Expiry <br> Date | Registered <br> Owner |
| :---: | :---: | :---: | :---: | :---: | :---: |
| New Kemess No. 1 | 43 | 18 | Jul $11 / 75$ | 1987 | Kennco |

In July, 1975, Getty Mines Ltd. abandoned the original twopost Kemess mineral claims and relocated the present M.G.S. mineral claims to more efficiently cover the known mineralization (Abandonment No. 180, Smithers). Their 1975 and 1976 exploration work was applied for assessment credit to maintain the claim group (Kemess Group \#4120, Dec. 11, 1975) in good standing until its expiration in 1987.

According to the results of a title search, undertaken by the writer on September 18, 1986 at the Gold Commissioner's' office in Smithers, all interests in the claims are owned by Kennco

$-S C A L E-$
$1000500 \quad 1000 \quad 2000 \mathrm{~m}$


Mal MINOREX CONSULTING LTD.
EL CONDOR RESOURCES LTD.
VANCOUVER, gRITISH COLUMBIA

CLAIM MAP
KEMESS PROPERTY OMINECA MINING DIVISION,B.C.

Explorations, (Western) Limited of Vancouver, British Columbia. The directors of El Condor Pesources Ltd. have reported to the writer that an option agreement hes been negotiated with the property owner; whereby, El Condor Resources will operate the property in fulfillment of this agreement.

## Physiography

The claims cover the north-facing slopes and highlands east of Duncan Lake. These highlands are part of the Omineca Mountains of the Swannell Range. Elevations within the claims range from 1,400 metres (4,593 feet) to 1,932 metres (6,339feet) A.M.S.L.

The glimate is moderate with temperatures ranging from $-40^{\circ} \mathrm{C}$. and $+25^{\circ} \mathrm{C}$. Precipitation is usually moderate. The snowpack usually thaws by late June, and the field season may extend until mid to late September.

The topography is moderately rugged, but there is a series of very steep east-west cirque cliffs situated centrally within the claims. The most westerly cirque contains an alpine rock glacier which appears to be still active. Most of the property is above treeline where the vegetation is scrub balsam and low juniper.

## History

Placer gold was discovered at the mouth of McConnell Creek, 30 kilometres northwest of Johansen Lake, in 1899. A short lived gold rush occurred as a result of this discovery in 1907.

In the 1930's Emil Bronlund of Cominco reportedly prospected the Thutade and Duncan Lakes area. No claims were recorded at the present property location but Cominco did patent four claims covering some lead-zinc mineralization, 3 kilometres west of the property (Stevenson, 1969).

In 1966, Kennco Explorations, (Western) Limited carried out a regional silt geochemical survey of the region which included those streams draining the claims. The following year Kennco staked 100 mineral claims covering the Kemess gossan.

The exploration work by Kennco in 1968 included: silt, soil and rock geochemical sampling, geological mapping ( $1: 9,600$ ), and X-ray diamond drilling which totalled 51 metres ( 168 feet) for two holes. Subsequent drilling by Kennco included four X-ray holes totalling 127 metres (418 feet) in 1969, and two X-ray holes totalling 54 metres ( 178 feet) in 1971 . The core recovery from most of this drilling was reported to be very poor to nil (Stevenson, 1969 and Cann, 1976). None of the Kennco drill core is present on the property.

Getty Mines, Limited optioned the property in 1975. Their
initial exploration work included: photogrammetric topographic mapping ( $1: 4,800$ ), relocation of the mineral claims, 'fill-in' soil geochemical sampling, gealogical mapping (1:4,800), and diamond drilling ( 5 NQ and $B Q$ holes totalling 589 metres or 1,932 feet). In 1976, Getty diamond drilled seven NQ-and 日Q-core holes totalling 1,476 metres ( 4,842 feet). All of this drilling was located within the Central Cirque area near Kennco's drill sites. The option agreement between Getty and Kennco was terminated in 1976 or 1977 , and there is no other reported exploration.

## gedlogic setting

The Toodoggone map-area, N.T.S. 94 E , has been the subject of several geological studies by various government geologists. These studies include those of Panteleyev ( 1983 and 1982) and T.G. Schroeter (1981). D.B. Forester studied the geology, petrology and precious-metal mineralization of the Toodoggone River area; and A.M. Cann mapped and dated the various lithologic units underlying the property. Both did their work while geological students at the University of British Columbia in 1984 and 1976, respectively. Much of the following text is based on the results of these recent studies.

The Toodoggone area lies within the eastern margin of the Intermontane Belt. The oldest rocks exposed are Proterozoic metasedimentary equivalents of the Ingenika Group. These rocks are unconformably overlain by volcanic and sedimentary units of the Permian Asitka Group. The Asitka Group is in turn overlain by Upper Triassic basaltic to andesitic flows, volcaniclastics and minor limestone belonging to the Takla Group (Monger, 1977). The Takla Group is overlain by volcaniclastic rocks of the Lower Jurassic Hazelton Group (Tipper and Aichards, 1976) and by rhyolitic to dacitic flows, intrusives, and volcaniclastics known as the 'Toodoggone' volcanics of Early Jurassic age. Further to the west, Cretaceous to Eocene (?) sediments overlie the volcanic strata (Gabrielse et al, 1980).

The Lower Jurassic to Cretaceous Omineca Intrusions of quartz monzonitic and grandioritic composition have intruded the older strata in the central and eastern portions of the region. Some syenomonzonite bodies and quartz feldspar porphyry dykes may be feeder structures to the Toodoggone rocks.

The stratigraphy trends northwesterly and commonly dips gently westward with a westerly younging direction. Numerous thrust and transcurrent faults displace the various lithologies.

Figure 3 and 4 of this report show the regional geology and summarize the lithologic units of the Toodoggone district.


After G.S.C. Open File 483, 1983.

| MINOREX CONSULTING LTD. |  |
| :---: | :---: |
| EL CONDOR RESOURCES LTD. |  |
| KEMESS PROPERTY OMINECA MINING DIVISION,B.C. |  |
| FE' NOVEMBER, 1986 | SCaLE AS SHOWN |
| M.OYT $\quad$ T.Q./r. | Owa.ко. 3 |

## quaternary

pleistocene ahd recent
Unconsolidated glacial, fluvioglacialo and alluvial deposits
cretaceous and tertiary
UPPER CRETACEOUS TO(?) EOCENE

| KTs |
| :--- |
| eT8P |
| UKT |

SIFTON FORMATION: Conglomerate, shale, siltstone, coal; dacitic volcanics
brothers peak formation: Conglomerate, tuff, siltstone, shale, sandstone
tango creek formation: Conglomerate, shale, siltstone, sandstone minor fetid limestone, nonmarine
JURASSIC
HIDDLE AND UPPER JURASSIC
bOWSER LAXE GROUP
kBL Shale, stltstone, pebble conglomerate


## 'TOODOGGONE' volcanic rocks

Dacite, latite, rhyolite, tuff, breccia, flows; local maroon weathering conglomerate includes local intrusive equivalents

LOWER JURASSIC
HAZELTON GROUP
IRH Volcantc conglomerate, breccia, lahar; abundant pink feldspar porphyry dykes and sills probably
TRIASSIC
takla group
Coarse-bladed plagioclase porphyry, augite porphyry, tuff, agglomerate; URTe, limestone, uRTs, fuff
permian
ASITKA GROUP(?)
Chert, argillite, limestone, greenstone; PAm, sericite and chlorite phyllite, foliatiofed chloritic greenstone, grit, acidic tuff(?), minor red chert; chlorite schist, grit, amphibolite,
Itmestone; PAc , marbie
pennsylvanian and permian
'LAy range assemblage'


CAMBRIAN AND ORDOVICIAM
KECHIKA GROUP


Limestone, phyllitic; calcareous shale, limestone, phyllite
CAMBRIAN
LOWER CAMbrian

## ATAN GROUP

IGAC Limestone, siltstone, dolomite
EAS Impure quartzite, shale, local sandstone, conglomerate
IEAG Quartzite, minor pebble conglomerate
PROTEROZOIC AND LOHER CAHBRIAN (UNDIVIDED)
HIEm Mica schist and phyllite, garnet-kyanite-mica schist, quartzite; HiEc, crystalline limestone
PROTEROZOIC
UPPER PROTEROZOIC


Amphiboltte, quartzite; Hic , crystalline limestone; Hg, augen gneiss; age uncertain Stelkuz formation

HIST
Siltstone and shale, green and maroon; sandstone, .limestone, locally pisolitic
espee formation
HIE
Limestone, localiy oolitic and pisolitic; dolostone in Cormier Range
TSAYDIZ FORMATION
Phyllite, sericitic; minor calcareous phyllite
SWARHELL FORMATIOH
Quartz-feldspar gritty sandstone, siltstone, shale, conglomerate; minor Ifmestone; metamorphic equivalents from chlorite to Kyanite grade; HISe , iimestone, sandy

GRANITIC ROCKS

TERTIARY
EOCENE
eTd
cretaceous
Kam
Quartz monzonite, mainly follated; Kqm ; migmatite and gneiss
JURASSIC
MIDDLE JURASSIC(?)
magd Granodiorite, leucocratic, pink; fine to medium grained
LOWER JURASSIC
1 kgm
IRd

> Dacite dyke

Granite, quartz monzonite eTm, migmatite, gneiss eTgd, granodiorite
 Quartz monzonite and granodiorite, locally megacrystic lRam, migmatite, gneiss Hornblende-quartz diorite and granodiorite; commonly contains biotite; foliate

## ULTRABASIC ROCKS

## TRIASSIC(3)

UPPER TRIASSIC(?)
UR URopdunite and peridotite; uRg, horablende gabbro, URpx, cilnopyroxenite; ukopx, olivine clinopyroxenite

SYMBOLS
geological boundary

GEOLOGY BY
H. Gabrielse, C.J. Dodds and J.L. Mansy, 1971-1975; G.H. Eisbacher, 1969-1971

GEOLOGY OF TOODOGGONE RIVER (94E) AND WARE WEST-HALF (94F) O.F. 483

A synoptic description of the major lithologic units in the Toddoggone region follows.

1. Proterozoic Rocks

These rocks form the western flank of a broad anticlinorium. The lower unit consists of a succession of sandstone, siltstone, shale, and minor conglomerate and limestone with metamorphic grades up to kyanite facies. Sericitic and calcareous phyllite, limestone, and a sequence of siltstone, sandstone, shale and limestone overlie the rocks of the lower unit. To the south, in the McConnell Creek map-area, these rocks are known as the Ingenika Group (Monger, 1977).

## 2. Asitka Group

The Asitka Group Comprising about 80 per cent calcite marble, 15 per cent chert, and 5 per cent argillite, sandstone and skarn with minor amounts of volcanic rocks) occur as 150-metre thick wedges within the region. Barr (1978) noted that the calcite marble has lost all evidence of its original texture, whereas the limestone and garnetiferous calcite marble retain some of their depositional textures. Skarns which have developed near contacts with the Omineca Intrusions commonly contain garnet, magnetite, tremolite and galena; and are the hosts for the silver-lead-zinc mineralization that was explored by Cominco (Barr, 1978).

Carter (1972) has noted that in the southwestern part of the Toodoggone map-area, limestone is thrust in a southerly direction over the volcanic rocks. The planes of schistocity in the limestone reflect the limbs of a recumbent isoclinal fold which has been warped into a broad open fold. A northwesterly striking axis, during a second period of folding, may be related to thrust faulting.
3. Takla Group

According to Forester (1984), the Late Triassic Takla Group of the region comprises:
a) tremolite andesite porphyry that commonly has 3 to 4 mm . euhedral tremolite needles in a dark grey groundmass of predominantly oligoclase and magnetite;
b) massive, light green aphanitic andesite that typically contains 1 mm. anhedral feldspar phenocrysts with minor pyrite and magnetite;
c) porphyritic andesite characterized by 2 mm . subhedral feldspars and augite phenocrysts in a fine-grained matrix of mainly plagioclase and pyroxene; and

FIGURE 4

Table of Formations for the Toodoggone District


## d) pyroclastic breccia composed of lapilli-size clasts of andesite in a poorly-sorted green to grey matrix.

The Takla volcanics have alteration facies that include: chloritization of augite phenocrysts, epidotization of plagioclase and mafic minerals, sericitization of feldspars, and silicification of all minerals adjacent to quartz veining (Forester, 1984). Unlike the Toodoggone voicanics, fracture controlled laumontite and anhydrite mineralization is pervasive within this group of rocks.
4. Hazelton Group

The Hazelton Group ranges in age from Lower Jurassic to lower Middle Jurassic (Tipper and Richards, 1976). These rocks occur in fault contact with the Toodoggone rocks and unconformably overlie the Takla volcanics. They include a succession of varicoloured andesitic to dacitic flows, breccias and volcanically-derived epiclastic sedimentary rocks (Forester, 1984).

According to Monger (1977), conglomerate, sandstone, breccia which contains clasts of Takla and Asitka rocks, and a granitic rock of unknown origin form the basal unit measuring 500 feet thick. The second unit of 4,000 feet comprises sandstone, conglomerate, breccia and tuff which grades upward into andesite, basalt and rhyolite flows and intercalated volcaniclastics. Marine greywacke, argillite, siltstone, tuff and basaltic breccia of 1,500 feet conformably overlie the second unit.

## 5. Toodoggone Volcanics

The Toodoggone volcanics form a distinctive map unit consisting of mainly airfall ash tuffs with subordinate ashflows, coarse pyroclastics, lava flows, and lenses of epiclastic sedimentary rocks (Panteleyev, 1983). This assemblage forms a northwesterly trending belt at least 90 kilometres long and 25 kilometres wide along the northeastern margin of the Sustut Basin.

According to Panteleyev (1983), rocks of the Toodoggone volcanic belt appear to be structurally conformable with Takla rocks, or they may overlie them with gentle angular unconformity. Elsewhere, Toodoggone volcanics are commonly in fault contact with bedded Takla, bedded Hazelton or Omineca Intrusive rocks. Locally, the Omineca granitic rocks intrude Toodoggone volcanics. Along its southeast boundary the Toodoggone volcanic belt is overlapped by Paleazoic Asitka and Triassic Takla rocks. The contact area is a series of stacked thrust plates. In this region Toodoggone rocks dip steeply and $Z-s h a p e d$ northerly trending folds occur with amplitudes of, at least, 20 metres. This is in marked
contrast to the area further north in the volcanic belt where gently dipping beds in tilted fault blocks or broad open folds with horizontal axes are the norm.

Six stratigraphic subdivisions of Toodoggone volcanic rocks have been recognized south of the Finlay River. The basal unit is exposed southeast of Kemess Creek and there is a northerly younging direction (Panteleyev, 1982). The Toodoggone volcanics comprise: andesitic, fine-grained, hornblende feldspar porphyry flows; decitio, lithic ash to lapilli tuff and crystal-lithic ash tuff; dacitic, crystallithic ash and lapilli tuff; basaltic, amygdaloidal feldspar porphyry flows; andesitic, feldspar orystal ash and crystallithic ash tuffs with some lapilli tuff and lahar deposits and rare agglomerates; and dacitic, subeerial ash flow.

Hydrothermal alteration is fracture controlled, mainly of the zeolites laumontite and stilbite with calcite. It may be deuteric. Zones of pyritization, sericitization and silicification are fracture controlled, and often contain preciousmetal mineralization (Panteleyev, 1982).

## 6. Gustut Group

In the Toodoggone area the Gustut Group is of Tertiary and Upper Cretaceous age (Gabrialse et al, 1976), and it unconformably overlies the Takla and Hazelton Groups. It comprises nonmarine conglomerate, shale, siltstone, tuff and minor limestone. Gabbroic dykes and sills intrude this unit.
7. Omineca Intrusions

Both the Asitka and Takla Groups are intruded by granitic rocks of the Omineca Intrusions. Megacrystic quartz monzonitic and granodioritic intrusions of Lower Jurassic to Middle(?) Jurassic age are most common. Stocks of granodiorite are commonly pink, leucocratic, and fine-to mediumgrained. Foliated quartz diorite also occurs locally (Cann, 1976).

Cretaceous-age quartz monzonite is commonly foliated and mylonitized along contacts. It locally separates the proterozoic and Mesozoic rocks.

Pink faldspar porphyry dykes are believed to be late stage differentiates of the Lower Jurassic intrusives, and may be feeder dykes for the Toodoggone volcanics (Carter, 1971).

The Toodoggone River area is widely known for its preciousmetal and copper mineralization. Both the Takla and Toodoggone volcanics host epithermal gold and silver mineralization. Repet-
itive normal faulting during Jurassic time provided the fracture channelways through which the mineralizing fluids migrated. Schroeter (1981) has dated alunite from a mineralized quartz vein which indicates that the major phase of mineralization occurred during the Early Jurassic time.

According to Forester (1984), silicified and mineralized zones range in width from a few millimetres to tens of metres, and generally pinch and swell along their length. The fracture controlled mineralization tends to be more abundant within the more competent volcanic rocks. The main ore minerals of the gold-silver deposits are acanthite, gold, silver and electrum with minor amounts of chalcopyrite, galena, sphalerite, polybasite and bornite. The camp silver to gold ratio is 20:1. Gangue minerals include: amethystine, chalcedonic and white quartz, calcite, pyrite, specular hematite, adularia and manganese oxide with lesser amounts of barite, fluorite, siderite and chlorite.

Copper-bearing sulphide mineralization occurs dominantly. within the Takla volcanics, especially near bladed feldspar porphyry units (Cann, 1976). It is fracture controlled, often associated with the porphyry dykes, and consists of pyrite, chalcopyrite and malybdenite with associated precious-metal values. The Cariboo Bell, Stikine, Galore Creek and Lorraine deposits are typical examples of the mineralization that can be found within the Takla Group.

Sphalerite and galena mineralization often occurs in the limestone units and skarn zones of the Asitka Group.

## discussion of previdus explonation results

The original Kemess mineral claims were staked by Kennco Explorations in December, 1967 to cover several copper and molybdenum silt geochemical anomalies. In 1968, their exploration work discovered that a zone of disseminated pyrite mineralization, approximately 610 metres ( 2,000 feet) by 3,353 metres (11,000 feet), is hosted by intensely fractured and silicified andesite, and that sericite and laumontite are associated with the pyrite. Epidote alteration occurs near its periphery. Within the pyrite zone, copper mineralization is indicated over a length of 1,829 metres ( 6,000 feet) with a width of 366 metres ( 1,200 feet). Silt samples from small drainages along the zone contained 600 to 4,800 p.p.m. copper, 10 to 285 p.p.m. molybdenum, and 2.0 to 4.0 p.p.m. silver. Two 25.6 -metre (84-foot) AX diamond drill holes at the east end of this zone averaged $0.21 \%$ copper, $0.007 \%$ molybdenum and $0.07 \mathrm{az./ton}$ silver; and $0.27 \%$ copper, $0.02 \%$ molybdenum and $0.08 \mathrm{oz./ton}$ silver (Stevenson, 1969).

The geological results indicated that: andesite of the Triassic Takla Group is intruded by a dioritic stock of the Omineca
(

Intrusions, as well as stocks of younger syenite porphyry, quartz monzonite porphyry and leucogranodiorite porphyry; an elongate body of quartz monzonite porphyry occurs parallel to the major fault zone which strikes $070^{\circ}$ and dips $-30^{\circ}$ northward over a length of 3 kilometres; and there seemed to be a genetic relationship between the mineralization and the quartz monzonite porphyry intrusion (Stevenson, 1969).

The results of the 1969 and 1971 diamond drilling programmes were not available to the writer so it is not known whether this later drilling intersected any substantial mineralization. Nevertheless, it is evident from the history of this property that Kennco did regard the copper-molybdenum mineralization with interest since they retained the mineral claims in good stending.

The geologic logs and analytical summaries for the 1976 diamond drilling programme were the only data available to the writer from Getty Mines' exploration work. The drill data accompanies this report as Appendix $V$.

## 1986 EXPLORATION PROGRAMME

The programme was supervised by the writer. It included: the establishment of a survey control grid (14.1 line-km.), prospecting ( $1: 2,500,4$ square km.), relogging and resampling of diamond drill core ( 147 core samples), soil geochemical sampling ( 351 samples), surface lithogeochemical sampling (33 samples), and geophysical surveying (ground magnetios, 14.1 line-km.). The field work, including mobilization and demobilization, was carried out over a 16 -day period from September 3 to 18, 1986. The report and accompanying plans were prepared after all the analytical and geostatistical results were received.

The writer prospected the central portion of the property, relogged the core from Getty Mines' 1975 and 1976 drilling programmes, and collected the surface lithogeochemical samples. Mr. Dwayne Windsor, an experienced geotechnician emplayed by Tarnex Geoservices, established the survey control grid and conducted the ground magnetics survey. Messrs. N. Martin and D. Steadman were employed by Minorex Consulting Ltd. to assist Mr. Windsor and the writer with the field programme.

The Statements of Qualifications for Mr. Windsor and the writer accompany this report.

## Survey Control Grid

The original control grid that was established by Kennco, and renovated later by Getty Mines, could not be utilized for the 1986 programme because many of the station sites were found to be
illegible or destroyed. Messrs. Windsor and Steadman tried to establish an east-west ( $090-270$ ) baseline using standard chain and compass methods, but after surveying an 800-metre line, it was found that the local magnetics had affected its orientation by $12^{\circ}\left(088^{\circ}\right)$.

A topographic photogrammetric map, prepared by Getty Mines, and a 'sighting' board were utilized to orient the baseline from established topographic features, and 'turn-off' the grid lines. All of the control grid was 'sight' picketed, and the survey stations were established using cedar pickets or rock cairns with flagging and a marked metal tag for labelling purposes. Despite these precautions, the final baseline is skewed slightiy (0920). The orientation and location of this control grid are shown on Figures 6 to 14.

The $100+00 \mathrm{~N}$. by $100+00 \mathrm{E}$. survey station (i.e. 10,000 metres North by 10,000 metres East) was established at the site of a distinct topographic feature identified on the topographic photogrammetric plan. The baseline was 'sight' picketed, flagged and labelled 900 metres eastward and 300 metres westward. At grid coordinates $100+00$ N. by $109+00$ E., $101+00 \mathrm{~N}$. by $112+00 \mathrm{E}$. and $102+00 \mathrm{~N}$. by $114+00 \mathrm{E}$. the baseline was offset northward to avoid the steep cliffs.

The northern grid lines were 'sight' picketed, flagged and labelled beyond the perimeter of the pyrite alteration zone. The southern grid lines were similarily established to the cliffs of the three cirques in the central portion of the property. Survey stations were established at so-metre intervals along grid lines that are 100 metres apart. After the initial soil geochemical sampling, intermediate 50 -metre stations were established between the grid lines. These intermediate stations were marked by rock cairns and flagging.

A total of 14.1 kilometres of control grid were established, including a 1.8-kilometre baseline and 12.3 kilometres of grid lines.

## Prospecting

The property has been mapped in detail by R.W. Stevenson for Kennco Explorations in 1968 and, later, by R.M. Cann for Getty Mines in 1975. The results of the geological study by R.M. Cann formed the basis for his 1976 thesis at the University of British Columbia. Messrs R.M. Cann and C.I. Godwin later published these results as a paper, titled 'Geology and age of the Kemess porphyry copper-molybdenum deposit, north-central British Columbia', in the CIM Bulletin, September, 1980.

Since the property had undergone recent detailed study, the writer undertook reconnaissance traverses to prospect and assess the geologic setting for its precious-metal potential. These traverses covered the northcentral portion of the property.

The results of the prospecting, and the locations and analytical results of the surface lithogeochemical samples are documented by Figures 6 and 14.

## Geochemical Surveys

## Soil Geochemical Survey

The soil geochemical samples were collected using a grub hoe or shovel. Survey notes of the sample character (i.e. active, dry, or swamp), texture (i.e. organic, clay, silt, sand, or gravel), origin (i.e. residual, colluvial, alluvial, or glacial), horizon, depth, colour, and location were taken et each sample location. From these notes, the soil geochemical samples were dominantly a mixture of silt, sand and gravel from the residual, colluvial and glacial overburden. The 'B' soil horizon was sought for the survey, but along the southern oliff faces ' $C$ ' horizon soils were collected in the absence of a 'g' horizon. The ' $B$ ' and 'C' soil horizons were usually sampled 5 to 10 centimetres beneath the surface to minimize any eolian contamination and/or organic matter.

The samples were placed in kraft paper envelopes, field dried, and delivered to Acme Analytical Laboratories Ltd. in Vancouver, B.C. for analysis. A total of 351 geochemical soil samples were collected over a 7 man-day period by Mr. D. Windsor of Tarnex Geoservices and Messrs. N. Martin and D. Steadman of Minorex Consulting Ltd., all experienced samplers.

At Acme Analytical Laboratories Ltd. the samples were dried at $60^{\circ} \mathrm{C}$. and sieved to -80 mesh. When insufficient -80 mesh material was found to be present in 'C' horizon-rich samples, the coarse reject fraction was ground to -80 mesh. All samples were analysed for 31 elements, including: molybdenum, copper, lead, zinc, silver, nickel, cobalt, manganese, iron, arsenic, uranium, thorium, strontium, cadmium, antimony, bismuth, vanadium, calcium, phosphorus, lanthanum, chromium, magnesium, barium, titanium, boron, aluminum, sodium, potassium, tungsten and gold. The first 30 elements were analysed by inductively coupled argon plasma (ICP) methods. The gold analyses were carried out using conventional atomic absorption methods. All analyses were conducted under the supervision of professional assayers.

At the writer's request Acme Analytical Laboratories Ltd. undertook a geostatistical analysis of the results using a microcomputer and a conventional statistical software programme. Mean, standard deviation and frequency percent data were plotted graphically to determine background, threshold and anomalous values for molybdenum, copper, lead, zinc, silver, arsenic, antimony, bismuth, barium and gold.

The soil geochemical results accompany this report as Appendix I, and Appendix III contains the geostatistical data. Fig-
ures 7 to 12 show the plotted and contoured results for the gold-, silver-, copper-, zinc-, molybdenum- and arsenic-in-soil analyses.

## Lithogeochemical Survey

The lithogeochemical samples were collected by the writer while relogging the 1975 and 1976 drill core or prospecting. All samples were properly described, labelled and delivered to Acme Analytical Laboratories Ltd. in Vancouver, B.C. for analysis. A total of 180 samples were collected during the programme, including 147 core and 33 surface lithogeochemical samples.

At Acme Analytical Laboratories Ltd. the samples were ground to - 100 mesh, and a 0.500 and 10 gram fraction of each were digested for either ICP or atomic absorption analysis, respectively. The surface samples were analysed for 31 elements, including: molybdenum, capper, lead, zinc, silver, nickel, cobalt, manganese, iron, arsenic, uranium, thorium, strontium, cadmium, antimony, bismuth, vanadium, calcium, phosphorus, lanthanum, chromium, magnesium, barium, titanium, boron, aluminum, sodium, potassium, tungsten and gold. The first 30 elements were analysed by inductively coupled argon plasma (ICP) methods. The gold analyses were carried out using conventional atomic absorption methods. The core samples were analysed for molybdenum, copper, lead, zinc, silver, arsenic and gold by the same methods. All analyses were conducted under the supervision of professional assayers.

At the writer's request Acme Analytical Laboratories Ltd. undertook a geostatistical analysis of the results using a microcomputer and a conventional statistical software programme. Mean, standard deviation and frequency percent data were plotted graphically to determine background, threshold and anomalous values for molybdenum, copper, lead, zinc, silver, arsenic, antimony, bismuth, barium and gold.

The lithogeochemical results accompany this report as Appendix II, and Appendix IV contains the geostatistical data. Figures 6 and 14 show the locations and partial analytical results for the surface samples.

## Geophysical Survey

## Proton Magnetometer Survey

It was recognized prior to the survey that the volcanic rocks may have similar magnetic 'signatures' or characteristics, but the survey was primarily directed toward identifying possible zones of hydrothermal alteration, shearing, or fracturing with associated sulphide mineralization. The hydrothermal destruction of primary magnetite, causing a low magnetics anomaly central to a hydrothermal alteration zone, is common with occurrences that
are spatially and genetically related to an intrusion. Latestage structural features, with groundwater movement, are also reflected by a ground magnetics survey.

A Barringer GM-122 proton magnetometer and a Scintrex MEs-2 base station magnetometer recorder were utilized for this survey. These instruments measure the total component of the earth's magnetic field to on accuracy of 1 gamma. The daily corrections for diurnal variations were made by correlating the base station readings with the field data.

The results of this survey have been plotted and contoured as Figure 13 of this report; and Figure 14 shows the geophysical results correlated with the other geological and geochemical data. Appendix VII contains the specifications for the two proton magnetometer instruments.

RESULTS OF THE 1986 EXPLORATION PROGRAMME

## Prospecting

The writer found while prospecting that the reported geological regults are well founded and accurate; thus, much of the following text is based on the geological results of R.M. Cann (1976 and 1980) and R.W. Stevenson (1968).

## Lithology

The property is underlain principally by intercalated, basaltic to andesitic flows and volcaniclastics belonging to the Savage Mountain Formation of the Upper Triassic Takla Group. Porphyritic stocks and dykes, comagmatic with an underlying granitic pluton, intrude the volcanic rocks (Cann and Godwin, 1980).

According to Cann and Godwin (1980), the lithologic units have been described and correlated stratigraphically, in order of decreasing age, as follows.

## UPPER TAIASSIC

TAKLA GROUP

## Savage Mountain Formation

i) Augite Porphyry (Unit 1)

This unit underlies the southern portion of the grid with an east-west trend. It is a drab grey-green rock containing stubby augite phenocrysts up to 6 mm . long in a slightly derker fine-grained groundmass. Often actinolite partially or completely replaces augite. The groundmass is
predominantly plagioclase (An 44) laths. Chlorite, epidote, sphene and actinolite occur in minor amounts. Pyrite and magnetite are disseminated in the rock.

## ii) Eladed Feldspar Porphyry (Unit 2)

This unit occurs in the southeastern portion of the grid. It is characterized by elongate plagioclase phenocrysts, varying in length from 5 to 20 mm ., in an aphanitic grey-green groundmass. The plagioclase phenocrysts (An 44) are unzoned and slightly to completely saussuritized, with partial to complete replacement by epidote. The groundmass contains trachytic plagioclase (An 28) microlites, devitrified glass and chlorite. Magnetite occurs as minor disseminations.

## Bladed Feldspar Porphyry Tuff Breccia (Unit 3)

This unit underlies most of the eastern portion of the grid. R.W. Stevenson (1968) called this unit an 'andesite breccia'.

It is composed mainly of subrounded, poorly-sorted bladed feldspar porphyry breccia fragments up to 0.6 m . across. Augite porphyry and felsic fragments occur in lesser amounts. The matrix is a crystal tuff, rich in euhedral to anhedral, moderately saussuritized plagioclase (An 30) crystals; minor angular, fine-grained quartz, chlorite and epidote also occur.

Basaltic Dykes (Unit 4)
These easterly trending dykes occur in the central portion of the grid. They are 0.5 to 0.75 metres wide with steep dips. The dykes are very dark brown-grey aphanitic rocks with fine-grained black pyroxene disseminated throughout. Plagioclase laths and augite phenocrysts occur in a chlorite-rich groundmass. Fine-grained magnetite is pervasively disseminated.
) Crystal Tuff (Unit 5)
This is the most extensive unit in the mapped area. It is a dark purple-grey to dark grey rock composed of euhedral to anhedral equant plagioclase crystals in an aphonitic groundmass. The plagioclase crystals vary in size from 2 to less than 0.03 mm. , and they are unzoned (An 35), oscillatory zoned or normally zoned. Quartz forms a few angular grains about 0.2 mm . in diameter. These minerals are contained in a very fine-grained groundmass of quartz, plagioclase and opaque minerals.

This unit underlies the southcentral portion of the
grid. It consists of a variety of fragments in a dark grey to dark grey-purple groundmass with plogioclase crystals. The fragments are quite distinct on weathered surfaces and include: epidote fragments up to 7 mm . across, angular andesitic fragments up to $11 \mathrm{~mm} .$, subrounded felsite fragments up to 12 mm . across, and angular quartz prophyry fragments up to 60 mm . in diameter. The groundmass is a crystal tuff containing euhedral to anhedral $1.5 \mathrm{~mm} .-10 \mathrm{ng}$ plagioclase (An 32 ) crystals and anhedral to subhedral quartz grains.

## LOWER TO MIDDLE (?) JURASSIC

## OMINECA INTRUSIONG

## Plutonic Rocks (Units 8a and 8b)

## vii) Quartz Monzonite (Unit Ba)

This unit occurs immediately northwest of the grid. It is pink, equigranular and fine- to medium-grained in appearance. Quartz, orthoclase and plagioclase occur in approximately equal proportions. Plagioclase (An 50) is slightly altered to sericite and locally contains patches of secondary biotite. Primary biotite, about 2 per cent of the rock, forms fine laths partiy altered to chlorite. Traces of magnetite make the rock weakly magnetic.

## viii) Granodiorite [Unit 8b]

This unit is a pink-grey, inequigranular, mediumgrained rock. There are two distinct varieties: one with abundant euhedral plagioclase crystals (An 50) in a finergrained groundmass of subhedral and anhedral quartz and orthoclase with hornblende, biotite and magnetite occurring as subhedral and euhedral grains up to 2 mm . across, and a second one that is conspicuously porphyritic with hornblende, plagioclase, quartz and magnetite as euhedral phenocrysts. The second variety has hornblende crystals up to 6 mm . in length, and quartz and plagioclase crystals commonly 2 to 3 mm . across. Its groundmass is mainly finegrained orthoclase.
ix) Feldspar Harnblende Porphyry and Crowded Feldspar Hornblende Porphyry (Unit 9)

This unit can be subdivided into two distinct units which occur in the northcentral to southeastern corner of the grid. Stevenson (1968) called this unit 'syenite'.

It is generally pink-brown or grey on fresh surfaces, and monzonitic in composition. Plagioclase forms euhedral, saussuritized phenocrysts, 0.2 to 2 mm . in length. Hornblende and more rarely augite form laths up to 2 mm . long,
and some poikilitic grains enclose plagioclase and opaque minerals. The groundmass is a fine-grained, cloudy mixture of chlorite, plagioclase, orthoclase and quartz.

The two subdivided units can be distinguished by: one containing 45 per cent phenocrysts, no augite and only poikilitic hornblende (i.e. feldspar hornblende porphyry, unit 9a), and the other containing 60 per cent phenocrysts of augite and poikilitic hornblende (i.e. crowded feldspar hornblende porphyry, unit 9b).
x) Quartz Plagioclase Porphyry (Unit 10)

This unit is exposed in the cliffs of the Central Cirque. Stevenson (1968) called this unit 'leucocratic granodiorite'.

It is a light grey rock with anhedral to subhedral quartz phenocrysts and epidote in an aphanitic groundmass. Plagioclase (An 30) crystals are moderately to well saussuritized. Epidote forms aggregates up to 5 mm . across with interstitial quartz and othoclase. The groundmass is a very fine-grained mixture of plagioclase, quartz, sericite and chlorite. Pyrite occurs as minor finely disseminated grains in the groundmass.

## xi) Leucocratic Feldspar Hornblende Porphyry (Unit 11)

An B-metre section of this unit occurs south of the East Cirque. The rock is buff to light grey in colour with phenocrysts of plagioclase and hornblende occurring in an aphenitic groundmass. Plagioclase (An 30) crystals are euhedral, unoriented, and moderately saussuritized. Hornblende is completely replaced by calcite and chlorite. Epidote occurs as aggregates after the alteration of plagioclase. The groundmass is very fine-grained plagioclase, quartz, calcite and sericite.

## Structure

The volcanic rocks have undergone intense structural deformation. Numerous faults, shears and fractures cut and displace the strata to a much greater degree than the intrusives, suggesting that the deformation of the volcanics predates the mejor tectonic events leading to the emplacement of the intrusions. None of the geologists, including the writer, have recognized any primary structures within the volcanics to determine whether they have undergone any regional or local folding.

Based on the distribution and trend of the lithologies and the structural data, major normal and transcurrent faulting occurs commonly in a east-northeasterly direction ( $070^{\circ}$ ), roughly parallelling the north-facing cliffs of all three cirques. There are two fault structures with this orientation, one in the cliffs
themselves, and a second one which transects the centre of all three cirques (see Figures 5 and 6).

Stevenson (1968) traced the 'cliff' fault for 3,000 metres (10,000 feet) in en east-northeasterly direction from the southwestern wall of the West Cirque to the southeastern wall of the East Cirque (see Figure 5). According to Stevenson (1968), this fault varies in dip from $-20^{\circ}$ to $-70^{\circ}$ northward, averaging $-30^{\circ}$ northward. This fault has a 15 cm gouge zone, and is bordered on both sides by intense shearing for 0.3 metre. There are numerous parisitic shear and fault structures parallelling this structure; most of which dip southward, but dips do vary from $-60^{\circ}$ southward to $-60^{\circ}$ northward.

The 'cliff' fault is very conspicuous in the steep northfacing slopes of the Central cirque. North of the fault, the country rocks are intensely pyritized and weathered to a bright orange or red colour. South of the fault, the rocks are much less mineralized and limonitic. The limonitic zones in the cliffs are restricted to transverse fault and shear zones cutting the main fault structure in a north to northwesterly direction. According to Stevenson (1968) and Cann (1976), these transverse structures occur with three different fracture orientations. One set of fractures strikes with $175^{\circ}$ to $180^{\circ}$ with vertical to $-60^{\circ}$ easterly dips. A second set strikes $025^{\circ}$ to $045^{\circ}$ and dips $-80^{\circ}$ to $-60^{\circ}$ southeastward. The third set strikes $135^{\circ}$ to $155^{\circ}$ and dips vary from $-50^{\circ}$ to $-70^{\circ}$ notheastward. All three fracture sets appear to be contemporaneous with the major faulting.

The second fault structure, called the 'cirque' fault, has been traced for 3,000 metres. It displaces the volcanics on the southeast side of the West Cirque and trends northeastward through the pass between the West and Central Cirques at grid coordinates $100+00 \mathrm{~N}$. by $99+00 \mathrm{E}$. At this point, the fault appears to curve, or be offset southeastward, to grid coordinate $98+50 \mathrm{~N}$. by $103+00 \mathrm{E}$. This change in strike direction is buried by glacial rubble but the geophysical results indicate that it is the same structure at both grid coordinates. From $98+50 \mathrm{~N}$. by $103+00$ E., the 'cirque' fault strikes east-northeastward through the pass to the East Cirque and is lost at $102+00 \mathrm{~N}$. by $113+00 \mathrm{E}$. It is the writer's opinion that the 'cirque' fault may spall, or 'horsetail' into several subparallel structures as it transects the East Cirque.

It is the writer's opinion that the Upper Triassic Takla volcanic rocks were fractured and displaced by northerly and easterly trending faults in Early Jurassic time. These structures controlled the emplacement of metal-rich hydrothermal fluids. The altered and mineralized volcanics rocks were later fractured and displaced prior to the intrusion of the Lower to Middle Jurassic plutonic rocks. Some of these ancient fracture systems have remained active regionally, but the local intrusives are generally quite poorly fractured and mineralized relative to the volcanic country rocks.

## Alteration

There are four main types of alteration including: quartz-sericite-pyrite, propylitic, zeolitic and hornfels. Field and petrographic studies by Cann (1976) indicate that they occur only within the roof pendant rocks. The distribution of the alteration assemblages is shown on Figure 5.

1. Quartz-Sericite-Pyrite

Pervasive quartz-sericite-pyrite alteration occurs as a large central zone and a smaller zone to the southwest. This alteration assemblage appears as envelopes surrounding veinlets of pyrite and fractures. It is characterized by pale bleached rock, with abundant boxworks commonly lined with jarosite after pyrite. Plagioclase is altered to quartz and muscovite, and sericite forms approximately 15 per cent of the rock. Chlorite and kaolinite form approximately 30 per cent of the rock. Rutile(?) occurs as disseminated bright orange grains. The abundance of sericite and sulphide boxworks decreases with a decrease in the intensity of alteration, and sulphides (pyrite) and goethite become increasingly more common.

Only quartz-sericite-pyrite alteration is known to be directly associated with the mineralization.
2. Propylitic

Propylitic alteration occurs as an elongate east-west zone parallel to and south of the central quartz-sericitepyrita zone. Propylitized rocks are green, and are characterized by local albitization and variable epidote, chlorite and calcite alteration.
3. Zeolitic

This alteration is most common in an area north of the quartz-sericite-pyrite zone; however, it is found locally throughout the property. Cann (1976) identified the zeolite 'laumontite' with the use of x-ray diffraction. Laumontite often occurs as fracture fillings up to 3 mm . thick in local shear zones. It is a soft, friable, salmon pink mineral which common in Takla Group rocks.
4. Hornfels

Hornfels alteration forms an irregular zone of variable intensity, primarily within the crystal tuff unit (Unit S). This zone seems to parallel the quartz monzonite and granodiorite contact. Intensely hornfelsed rocks are massive, fine-grained, and pale grey to brown in colour. Alteration products include: quartz, andalusite(?), epidote, sericite and chlorite. Pyrite occurs locally as microveinlets and fine-grained disseminations.

The known mineralization, in order of abundance, includes: pyrite, chalcopyrite, magnetite-hematite, molybdenite and digenite. Pyrite occurs as microveinlets and disseminations within the gossan zone. Its abundance varies from 0.5 to 10 per cent, and is directly proportional to the intensity of fracturing and alteration.

Chalcopyrite occurs in microveinlets or, more commonly, as disseminations with pyrite, magnetite-hematite, and the gangue minerals quartz and orthoclase. Digenite rims chalcopyrite grains where supergene mineralization occurs Cann and Godwin, 1980). Molybdenite has been found to be spatially associated with the quartz-sericite-pyrite alteration zone, as a fracture filling.

According to Cann and Godwin (1980), "The results of the diamond drilling show that the highest copper grades are associated with aphanitic andesite and feldspar porphyry andesite flows adjacent to and west of the central intense quartz-sericitepyrite zone. Furthermore, the strong development of gossan on the bladed feldspar porphyry unit and the abrupt termination at the lower contact of the lithic tuff unit indicates that the mineralization is partly controlled by stratigraphy." It is important to note, however, that all but one drill hole was located west of the intense quartz-sericite-pyrite zone and no core is reported to have been recovered from the drilling of hole KX-7.

Drilifing results show that there is a 10- to 20-metre leached cap over the known copper mineralization, and assay results show that, beneath this cap, the mineralization is enriched for a thickness of up to 30 metres.

## Geochemical Surveys

## Soil Geochemical Survey

Figures 7 to 12 of this report show the plotted and contoured soil geochemical results for gold, silver, copper, zinc, molybdenum and arsenic. The writer has summarized the geastatistical data for ten elements in the following table.

| Element | Minimum <br> Value(ppm) | Maximum <br> Value(ppm) | Mean <br> $(\mathrm{PPm})$ | Standard <br> Deviation | Coefficient of <br> Variance |
| :--- | :---: | :---: | :--- | :---: | ---: |
| Gold | $6.0^{*}$ | $2,110.0 *$ | $277.4 *$ | 299.4 | $89,652.60$ |
| Silver | 0.1 | 20.2 | 1.2 | 1.9 | 3.53 |
| Copper | 2.0 | $2,686.0$ | 177.9 | 275.9 | $76,124.10$ |
| Lead | 2.0 | 672.0 | 44.5 | 56.2 | $3,160.70$ |
| Zinc | 1.0 | 493.0 | 78.3 | 57.1 | $3,262.30$ |
| Molybdenum | 1.0 | 235.0 | 25.5 | 33.6 | $1,130.50$ |


| Element | Minimum Value(ppm) | Maximum Value(ppm) | Mean <br> (ppm) | Standard <br> Deviation | Coefficient of Variance |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Arsenic | 2.0 | 228.0 | 13.9 | 18.1 | 327.81 |
| Antimony | 2.0 | 8.0 | 2.2 | 0.6 | 0.33 |
| Bismuth | 2.0 | 146.0 | 4.8 | 8.2 | 66.64 |
| Barium | 4.0 | 696.0 | 113.9 | 85.9 | 7,382.10 |
| Total num | ber of sam | es: 351 | * par | $s$ per billi | on (p.p.b.) |

The soil geochemical results have been interpreted as follows.

1. Gold

The gold-in-soil values are extremely high considering that the mean is $277.0 \mathrm{p} . \mathrm{p} . \mathrm{m}$, including a maximum value of 2,110 p.p.b. (2.11 p.p.m., 0.074 o.p.t.). It is obvious from the above table that there are a number of extremely high values which have skewed the geostatistical data; nevertheless, it is very encouraging to find such high values in soils over a previously unrecognized precious-metal setting.

The survey identifies one large anomaly of greater than 1,000 p.p.b. gold and a number of smaller, more local sites with equally high results. The highest and largest gold-insoil anomaly is centred at grid coordinates 102+00 N. by $107+50 \mathrm{E}$. Within this anomaly there are eight sample sites with values greater than 1,000 p.p.b. gold. The location of this anomaly is coincident with two mapped intrusions of feldspar hornblende porphyry. Geological results show that the volcanics in this area are highly fractured, altered and pyritized. This anomaly lies immediately west of Kennco's drill hole $K X-7$ which had no core reported recovery.

Two single-site anomalies are underlain by highly fractured and altered valcanics near or within the mapped quartz-sericite-pyrite alteration zone at grid coordinates 101+50 N. by $109+00 \mathrm{E}$. and $104+00 \mathrm{~N}$. by $109+00 \mathrm{E}$. These two anomalies are downslope of the larger one and may represent its transported extengions.

There is another very high gold-in-soil anomaly at grid coordinates $105+50 \mathrm{~N}$. by $106+00 \mathrm{E}$. It is underlain by poorly fractured and altered volcanics, immediately north of the pyrite halo. This anomaly seems to be spatially related to the pyrite halo rather than the minor copper mineralization which has been mapped in the vicinity.

It is interesting to note that the gold-in-soil results at the Central Cirque, where most of the drilling has been carried out, are relatively low. The copper-in-soil values for this area are highly anomalous. Such a contrast would lead one to believe that there is significant and untested precious-metal mineralization east of the drilled area.

## 2. Silver

The silver-in-soil results show that precious-metal mineralization is spatially, and possibly genetically, associated with the quartz-sericite-pyrite alteration zone at the East Cirque. There are three single-site silver-in-sail anomalies (greater than 5 p.p.m. silver) south and east of the large gold anomaly at $102+00 \mathrm{~N}$. by $107+50 \mathrm{E}$. These amomalies may be reflecting the bedrock geochemistry, or may be transported downslope from the 'cliff' fault zone.

There is an elongate silver-in-soil anomaly at $105+00$ N. to $106+00$ N. by $104+50$ E. to $106+50 \mathrm{E}$. This anomaly is supported by high gold and copper geochemistry, near the northern baundary of the pyrite halo (gossan zone).

There is a single-site silver anomaly in a swampy area at $99+00$ N. by 104+00 E.

## 3. Copper

Anomalous copper-in-soil values (greater than 730 p.p.m.) are mainly situated within the Central Cirque area, near the drilling. There are a number of single- and double-site anomalies north and southeast of the large gold soil anomaly.

It in interesting to note that the copper soil geochemistry is very high over the propylitically altered rocks, and the copper soil anomalies seem to surround the quartz-sericite-pyrite alteration zone with its high gold and molybdenum geochemistry.
4. Zinc

The anomalous zinc soil geochemistry is restricted to the East Cirque. There are several anomalous single-site zinc-in-soil (greater than 193 p.p.m.) at grid coordinates 100+00 N. to $102+00$ N. by $109+00$ E. to $114+00$ E. They appear to reflect high base-metal geochemistry around the quartz-sericite-pyrite alteration zone. A large zinc soil anomaly at $106+00$ N. by $113+00$ E.

## S. Malybdenum

Anomalous molybdenum soil geochemical values (greater than 93 p.p.m.) correlate well with the quartz-sericitepyrite alteration zone and high precious-metal geochemistry. A large anomaly at $101+50$ N. by $107+50$ E. is coincident with the large gold soil anomaly. There are also several singlesite anomalies to the west and north which appear to reflect the periphery of the silicic and sericitic alteration.
6. Arsenic

The high arsenic soil anomalies (greater than 50 p.p.m.)
occur only at the East Cirque. They surround the large gold soil anomaly with other silver and base-metal values.

In summary, the soil geochemical results are very interesting. They indicate that the most intensely altered rocks with the highest precious-metal geochemistry have not been tested by drilling.

## Lithogeochemical Survey

Most of the lithogeochemical samples were collected from the core of Getty Mines' diamond drilling programmes. The analytical results confirm the reported 1976 assay results; nevertheless, the resampling was justified because now there are analytical results for the 1975 diamond drilling on record.

The samples 86-19-148 and 149 were collected from the ferricrete deposits east and north of the camp. Their results were expected - very high copper, manganese and iron values.

High gold and silver lithogeochemical results (127 to 200 p.p.b. Au and 0.7 to $1.0 \mathrm{p} . \mathrm{p} . \mathrm{m}$. Ag) were returned from those samples that were collected near $101+50 \mathrm{~N}$. by 107 E , the same area where the highest and most extensive gold soil geochemical samples occur.

High copper, lead, and zinc values occur peripheral to the quartz-sericite-pyrite alteration zone, commonly associated pyritized, propylitically altered rocks.

## Geophysical Survey

Prior to the field work it was discussed whether a 'Very Low Frequency' electromagnetics (VLF-EM) survey should be conducted in conjunction with a proposed ground magnetics survey. It was decided that, due to the orientation of the mapped structural features with respect to the current transmitting stations, such a survey would be very difficult to complete within the limited field time. In retrospect, VLF-EM (EM-16) and induced polarization surveying should be undertaken during future exploration.

## Proton Magnetometer Survey

The ground magnetic results accompany this report as Figure 13. The survey covered the control grid at 25-metre intervals. Magnetic readings ranged from 58,000 to 63,500 gammas. An interpretation of the results indicates the following:

1. The ground magnetics strengthen from the East Cirque westward to the pass between the Central and West Cirques.
2. There is a relatively wide dyke-like feature parallel to the baseline, from grid coordinates $100+00 \mathrm{~N}$. by $97+00 \mathrm{E}$. to
$100+00 \mathrm{~N}$. to $107+00 \mathrm{E}$. This feature probably reflects a magnetic intrusive hosted by the 'cirque' fault. Near the quartz-sericite-pyrite alteration zone its magnetic susceptibility decreases with increased hydrothermal alteration.
3. At grid coordinates $106+00$ N. by $106+00$ E. and $102+00$ N. by $103+50$ E., there is a sharp increase in magnetics reflecting the northern edge of the pyrite zone.
4. The quartz-sericite-pyrite alteration zone responds with low magnetic susceptibilities.

## DISCUSSION OF THE EXPLOAATION RESULTS

The exploration results are very encouraging. Geological results show that the property is located over a roof pendent of Upper Triassic Takla volcanic rocks as a result of the intrusion of an Early Jurassic calc-alkaline pluton. The known mineralization appears to be genetically related the late stages of the intrusive event.

The soil and rock geochemical results indicate that there are highly anomalous gold and silver values spatially, and possibly genetically, associated with a large structurally controlled zone of intense hydrothermal alteration in a poorly explored area of the property. The tested copper, molybdenum and minor preciousmetal mineralization occurs within an area of propylitically altered volcanics, west of the most intense hydrothermal alteration.

The results of the ground magnetic gurvey show that the Takla Group volcanics has been intensely altered within the quartz-sericite-pyrite zone and, to a lesser extent, within the propylitic zone. They also show that the east-northeasterly trending 'cirque' fault crosses the central portion of the property.

## EXPLORATION PGTENTIAL

Past geologists have compared the geologic setting of this property with that of the Schaft Creek porphyry copper-molybdenum deposit, located 72 kilometres south of Telegraph Creek, 日.C. It is true that the age, calc-alkaline character and geologic setting of the Schaft Creek deposit are similar, but most of the exploration here has been for discovering a porphyry coppermolybdenum deposit rather than exploring for its precious-metal mineralization.

It is the writer's opinion that there are two types of mineralization. The first type is the fracture controlled and disseminated copper and molybdenum mineralization. This mineralization has been sparingly tested by two operators, and the known grades are subeconomic at current metal prices. The second type is gold-and silver-bearing sulphide mineralization which is spatially and genetically related to the intense hydrothermal alteration at the East Cirque. It is this second type of mineralization which requires detailed exploration.

## CONCLUSIONG

It is the writer's opinion that further exploration is definitely warranted for the following reasons.

1. The property is located within one of the most interesting and active exploration camps in the province.
2. The altaration and mineralization are spatially, and probably genetically, related to calc-alkaline stocks and dykes which intrude a roof pendant of Takla Group volcanics. This setting is very similar to a number of known copper-molybdenum and gold-copper deposits.
3. Past exploration attempted to test the known porphyry coppermolybdenum mineralization but ignored, or did not recognize, the precious-metal potential of this property.
4. The quartz-sericite-pyrite alteration zone at the East Cirque has been mapped for 700 metres in an east-northeasterly direction and 500 metres in a north-northwesterly direction.
5. A 300 by 200 -metre coincident gold and molybdenum soil geochemical anomaly is situated along the exposed western edge of the quartz-sericite-pyrite alteration zone.
6. Lithogeochemical samples from the bedrock within the gold and molybdenum soil geochemical anomaly all show elevated gold and silver values.

## COST ESTIMATES

The following work is reoommended to test the precious-metal potential of this property.

1. Conduct electromagnetics (VLF-EM) and induced polarization (time domain, dipole-dipole array) surveys.
2. Test the exploration results with diamond drilling.
3. Contingent upon the success of the above, delineate the mineralization with diamond drilling for reserve estimation.

## Stage I



Stage II


Submitted by,
MINOREX CONGULTING LTD.

December 10, 1986
Kamloops, 日.C.


## STATEMENT OF QUALIFICATIONS

I, J. DOUGLAS BLANCHFLOWER, of the City of Kamloops, Province of British Columbia, DO HEREGY CERTIFY THAT:

1) I am a Consulting Geologist with a business office at Suite 200 A - 156 Victoria Street, Kamloops, British Columbia, V2C 1Z7; and President of Minorex Consulting Ltd.
2) I am a graduate in geology with a Bachelor of Science, Honours Geology degree from the University of British Columbia in 1971.
3) I am a Fellow of the Geological Association of Canada.
4) I have practised my profession as a geologist for the past fifteen years.

Pre-Graduate experience in Geology, Geochemistry and Geophysics in Eritish Columbia, Yukon and Northwest Territories ( 1966 to 1970).

Three years as Geologist with the Eritish Columbia Ministry of Energy, Mines and Petroleum Resources (1970 to 1972).

Seven years as Exploration Gealogist with Canadian Superior Exploration Limited (1972 to 1979).

Three years as Exploration Geologist with Sulpetro Minerals Limited (1979 to 1982).

Four years as Consulting Geologist with Minorex Consulting Ltd. (1982 to 1986).

Active mineral exploration and development experience throughout Western North America.
5) I own no direct, indirect or contingent interest in the subject claims, nor shares in or securities of EL CONDOR RESOURCES INC.
6) I supervised the 1986 exploration programme on this property and wrote this report which documents the results.
7) I consent to the use of this report in a prospectus or statement of Material Facts.


Dated at Kamloops, B.C., this 10 th day of December, 1986.

## STATEMENT OF QUALIFICATIONS

I, DWAYNE M. J. WINDSOR, of the City of Kamloops, Province of British Columbia, DO HEREBY CERTIFY THAT:

1) I am a consulting Geological Technologist with a business office at 1013 Dundas Street, Kamloops, British Columbia, V2日 1T1; and President of Tarnex Geoservices.
2) I am a graduate Geotechnologist with a diploma from Sir Sanford Fleming College in 197B.
3) I have practised my profession for the past 11 years.

Pre-Graduate experience in Geology, Geochemistry and Geophysics in Quebec and Saskatchewan (1976 to 1977).

Nine years as a Geophysical and Geological Technologist with Novamin Resources (formerly Sulpetro Minerals Limited) in British Columbia, Yukon Territory, Northwest Territories, Ontario, Quebec and Nova Scotia.

One year as Consulting Geological Technologist with Tarnex Geoservices.
4) I own no direct, indirect or contingent interest in the subject claims, nor shares in or securities of EL CDNDDA RESOURCES INC.
5) I carried out the proton magnetometer survey of the Kemess property between September 6th and 15th, 1986.


Dwayne M. Windsor

Dated at Kamloops, B.C., this MOth day of December, 1986.

Barr, D.A., 1978:
B.C. Ministry of Energy, Mines and Pet. Res., 1983:

Boyle, R.W., 1979:

Cann, R.M. and Godwin,

Cann, R.M., 1976:

Carter, N.C., 1972:

Forester, D.B., 1984:

Fox, P.E., Grove, E.W., Seraphim, R.H., and Sutherland Brown, A., 1976:

Gabrielse, H., Dodds, C.J., Mansy, J.L., 1976:

Gabrielse, H., Wanless, R.K., Armstrong, R.L., Erdman, L.R., 1980

Getty Mines, 1976:
Lord, C.s., 1948:
Chappelle Gold-Silver Deposit,
British Columbia; CIM Bulletin,
February, 1978, pp. $66-79$.

Minfile; No. Q94E 021; p. 05322.

The Geochemistry of Gold and Its Deposits; G.s.C. Bulletin 280, 548p.

Geology and Age of the Kemess Porphyry Copper-Molybdenum Deposit, North-central British Columbia; CIM Bulletin, September, 1980, pp.94-98.

Geology of Kamess Porphyry Copper Property, North-central British Columbia; unpublished 日.Sc. thesis, Dept. of Geological Science, Univ. of British Columbia.

Toodoggone River Area; B.C. Dept. of Energy, Mines and Pet. Res., G.E.M., 1971, pp. 62-64.

Geology, Petrology and Precious Metal Mineralization, Toodoggone River Area, North-central British Columbia; unpublished M.Sc. thesis, Dept. of Geological Sciences, Univ. of British Columbia.

Schaft Creek, Porphyry Deposits of the Canadian Cordillera, (ed. A. Sutherland 日rown), CIM Special Volume 15, pp. 219-226.

Toodoggone Aiver ( $94 E$ ) map-area, G.S.C., Open File 306.

Isotopic Dating of Early Jurassic Volcanism and Plutonism in Northcentral British Columbia; Current Research, Part A, G.S.C., Paper 80-1A, PP. 27-32.

Drill Logs and Assay Summaries.
McConnell Creek map-area, Cassiar District, British Columbia; G.s.C. Memoir 251, 72p.

Monger, J.W.H., 1977:

Panteleyev, A., 1983:

Schroeter, T.G., 1982:

Stevenson, R.W., 1969:

Stevenson, R.W., 1968:

Tipper, H.W., Aichards, T.A., 1976:

The Triassic Takla Group in MoConnell Creek map-area, north-central British Columbia; G.S.C. Paper 76-29.

Geology Between Toodoggone and Sturdee Rivers (94E); B.C. Ministry of Energy, Mines and Pet. Res., Geological Fieldwork, 1982, Paper 1983-1, Pp. 143-148.

Toodoggone Volcanics South of Finlay River (94E); B.C. Ministry of Energy, Mines and Pet. Res., Geological Fieldwork 1981, Paper 1982-1, pp. 135-141.

Toodoggone River (94E), B.C. Ministry of Energy, Mines and Pet. Res., Geological Fieldwork, 1981, Paper 1982-1, pp. 122-133.

Cassiar Reconnaisance, Part I of III; private company report for Kennco Explorations, (Western) Limited, March 14, 1969.

Report on Geological and Soil Geochemical Surveys, Kemess No. 1, 2 and 3 Groups, Eritish Columbia; assessment report for Kennco Explorations, (Western) Limited.

Jurassic stratigraphy and History of North - central Eritish Columbia; G.S.C. Bulletin 270, 73p.

## APPENDIX I

Acme Analytical Laboratories Ltd. Certificate of Analysis - Soil Samples
 표 하옹ㅇㅇ


用高
FILE \＃B6－2918

$$
\begin{aligned}
& \text { F86-19 KEMESS } \\
& \text { Cd } 5 b
\end{aligned}
$$


$\pm \sim$ ロッ～

－m 管
 고논N
블
흘
폴 Hy
NH nO
NNO －-元里
톨 SEPT $2919 \% 6$ DATE REPORT MAILED：Cet $1 / 86$ REPORT MAILED：
C．E．C．ENGINE RING
U
PPK $\begin{array}{cc}\mathrm{Fe} & \text { As } \\ 2 & \mathrm{PPH}\end{array}$ 엉
$-\infty$
 $\infty \infty$
늘





 운 들

PAGE 1
 동응ㅇㅇ 옹응응홍큰능



붕․․
핳ㅇㅇㅇㅇ 웅ㅎㅇㅇ 훙ㅇㅇㅇ
홍ㅎㅎㅇ



－




$\underset{\sim}{9}$
NH

ーーーーかールーーー
いーーーツ

홍영


ッターデ～

$\rightarrow$ のッロ
훙웅웅
ص훙웅쿵










NーローN
웆운훚웅
운오뭎모웊
붓으웆웅
요옺웆웆으 웆


※円だ

$\Rightarrow$
Gong
Mr
尘呙款等
Mジッニ
＂Mo오


$\ddagger$
かッジッロ

ッロッいが
Nammm
$+N$
日m

畐

9400E 104＋00K
 총 34＋00E 102＋00N

 $99+00 \mathrm{E}$ 100400N
$99+00 \mathrm{E} 99+50 \mathrm{~K}$
늘 플 DATE RECEIVED：


| SAKPLEI | MoPP\% | ${ }_{4}$ | Pb | 2n | Ag | C.E.C. ENGINEERING |  |  |  |  |  | FORJECT |  |  | F86-19 YEMESS |  |  |  | F FILE \# 86-2918 |  |  |  |  | la | $\begin{array}{r} \mathrm{T} \\ \mathrm{I} \end{array}$ | PPK | $\begin{gathered} \mathrm{Al} \\ \mathrm{Z} \end{gathered}$ | $\begin{gathered} \mathrm{Na} \\ \mathrm{I} \end{gathered}$ | PAGE |  | 3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  | $\mathrm{N}_{1}$ | Co | Mn | Fe | As | U | Au | Th | Sr | Cd | 5b | Di | $V$ | C2 | P | La | Cr | Hg |  |  |  |  |  | $k$ | N | Aut |
|  |  | PPM |  |  |  | PPK | PPM | PPA | 1 | PPM | PPK | PPM | PPI | PPM | PPM | PPM | PPH | PPM | 1 | 1 | PPK | PPM | 7 | PPM | 1 |  |  |  | 2 | PPK | P8P |
| 101450E 100+00N | 44 | 325 | 28 | 106 | 1.0 | 9 | 18 | 566 | 7.79 | 3 | 5 | ND | 1 | 13 | 1 | 2 | 2 | 149 | . 13 | . 225 | 6 | 22 | 1.04 | 121 | . 08 | J | 3.95 | . 03 | . 37 | 1 | 340 |
| 102+00E 105 400 N | 3 | 21 | 22 | 74 | . 5 | 5 | 1 | 618 | 3.51 | 3 | 5 | ND | 1 | ${ }^{1}$ | 1 | 2 | 2 | 73 | . 55 | . 102 | $\theta$ | 1 | . 41 | 64 | . 07 | 5 | 3.67 | . 01 | . 06 | 1 | 32 |
| 102+00E 105+50K | 2 | 54 | 23 | 94 | . 1 | 6 | 10 | 140 | 2.72 | 2 | 5 | N0 | 1 | 163 | 1 | 2 | 2 | 57 | 2.53 | . 116 | 8 | 9 | . 54 | 78 | . 05 | 2 | 4.18 | . 01 | . 16 | 1 | 21 |
| 102+00E $305+00 \mathrm{H}$ | 19 | $35!$ | 33 | 53 | . 3 | 2 | 21 | 251 | 24.19 | 9 | 5 | ND | 2 | 54 | 1 | 3 | 2 | 57 | . 12 | . 138 | 23 | 14 | . 43 | 137 | . 04 | 11 | 1.62 | . 01 | . 12 | 1 | 71 |
| 102+00E $104+50 \mathrm{~N}$ | 41 | 1801 | 52 | 157 | . 1 | 2 | 17 | 193 | 43.80 | 24 | 5 | NO | 2 | 4 | 2 | 2 | 2 | 26 | . 03 | . 411 | 57 | 1 | . 07 | 10 | . 01 | 2 | 1.38 | . 01 | . 03 |  | 36 |
| 102+00E 105400N | 25 | 180 | 31 | 70 | . 5 | 10 | 14 | 412 | 6.36 | 7 | 5 | HD | 1 | 101 | 1 | 2 | 2 | 05 | . 51 | . 163 | 12 | 19 | . 72 | 255 | . 03 | 4 | 3.68 | . 02 | . 19 | 1 | 72 |
| 102+00E 103+50K | 22 | 153 | 28 | 55 | . 7 | 10 | 10 | 222 | 4.85 | 5 | 5 | ND | 1 | 77 | 1 | 2 | 3 | 83 | . 10 | . 140 | 10 | 19 | . 64 | 222 | . 02 | 5 | 2.82 | . 01 | . 15 | 1 | 81 |
| 102400E 102 250 N | 4 | 37 | 7 | 23 | 1.6 | 9 | 3 | 84 | 1.29 | 2 | 5 | KD | 1 | 23 | 1 | 2 | 3 | 27 | . 07 | . 223 | 4 | 17 | . 17 | 43 | . 01 | 2 | 2.20 | . 01 | . 04 | 1 | 16 |
| 102+00E 102+00K | 28 | 192 | 26 | 120 | . 3 | 22 | 16 | 530 | 7.75 | 4 | 5 | ND | 1 | 13 | 1 | 2 | 2 | 259 | . 09 | . 127 | 12 | 33 | 2.49 | 150 | 118 | 2 | 4.12 | . 02 | . 61 | 1 | 250 |
| 102400E 101+50 | 30 | 440 | 21 | 112 | 1.0 | 19 | 25 | 467 | 7.19 | 9 | 5 | ND | 2 | 97 | 1 | 2 | 2 | 118 | . 16 | . 153 | 7 | 31 | 1.96 | 232 | . 14 | 7 | 4.23 | . 03 | .67 | 1 | 25 |
| 102+00E 101400\% | 4 | 21 | 11 | 24 | . 1 | 4 | 4 | 118 | 2.28 | 2 | 5 | ND | 1 | 35 | 1 | 2 | 2 | 59 | . 11 | . 046 | 5 | 17 | . 18 | 80 | . 05 | 2 | 1.47 | . 01 | . 04 | 1 | 48 |
| 102+00E $100+50 \mathrm{~K}$ | 9 | $10!$ | 12 | 29 | 1.5 | 8 | 6 | 130 | 2.73 | 4 | 5 | ND | 1 | 20 | 1 | 3 | 3 | 43 | . 05 | . 201 | 15 | 21 | . 34 | 16 | . 01 | 2 | 2.59 | . 01 | . 05 | 1 | 184 |
| 102+00E 100+00N | 12 | 16 | 17 | 67 | . 4 | 10 | 8 | 302 | 4.53 | 6 | 5 | NO | 1 | 37 | , | 2 | 3 | 108 | . 08 | . 143 | 7 | 21 | . 89 | 10 | . 03 | 2 | 2.75 | . 01 | . 11 | 1 | 145 |
| 102400 $94+5$ ON | 27 | 178 | 23 | 97 | 1.6 | 8 | 14 | $5!3$ | 8.51 | 9 | 5 | KD | 2 | 67 | 1 | 2 | 6 | 90 | . 01 | . 259 | 8 | 25 | 1.50 | 155 | . 02 | 6 | 3.05 | . 02 | . 11 | 1 | 470 |
| 102+00E 99+00K | 13 | 12 | 42 | 91 | . 4 | 4 | 12 | 435 | 7.68 | 13 | 5 | NO | 1 | 45 | 1 | 3 | 2 | 86 | . 14 | . 213 | 9 | 23 | . 79 | 201 | . 04 | 4 | 2.76 | . 02 | .11 | 1 | 125 |
| 102+00E 98+50M | 6 | 40 | 12 | 62 | . 3 | 7 | 7 | 353 | 4.40 | 4 | 5 | ND | 1 | 41 | 1 | 2 | 2 | 67 | . 09 | . 152 | 7 | 20 | . 56 | 116 | . 02 | 3 | 2.73 | . 01 | . 05 | 1 | 106 |
| 102+00E 78+00N | 9 | 33 | 41 | 73 | . $B$ | 9 | 5 | 395 | 4.36 | 17 | 5 | KD | 1 | 56 | 1 | 2 | 2 | 79 | . 07 | . 250 | 1 | 25 | 1.36 | 103 | . 01 | 2 | 2.22 | . 02 | . 05 | 1 | 280 |
| 102+50E $100+00 \mathrm{~N}$ | 7 | 46 | $B$ | 25 | 1.2 | 4 | 4 | 142 | 2.49 | 2 | 5 | ND | 1 | 38 | 1 | 2 | 2 | 29 | . 12 | . 173 | 4 | 11 | .17 | 81 | . 01 | 2 | 1.35 | . 01 | . 05 | 1 | 63 |
| 103+00E 106 +00 N | 2 | 10 | 25 | 139 | . 1 | J | 5 | 661 | 1.99 | 2 | 5 | ND | 1 | 157 | 1 | 2 | 5 | 35 | 2.97 | . 074 | 7 | 7 | . 51 | 44 | . 06 | 2 | 3.95 | . 01 | . 13 | 1 | 15 |
| 103+00E 105+50K | 5 | 34 | 17 | 39 | 1.0 | 4 | 4 | 140 | 1.64 | 3 | 5 | ND | 1 | 32 | 1 | 3 | 2 | 32 | . 15 | . 140 | 6 | 12 | . 26 | 48 | . 01 | 2 | 2.23 | . 0 | . 04 | 2 | 36 |
| $103+005105+00 \mathrm{~N}$ | 1 | 110 | 35 | 97 | . 5 | 5 | 12 | 399 | S. 31 | 6 | 5 | K( ${ }^{\text {d }}$ | 1 | 118 | 1 | 2 | 2 | 73 | . 78 | . 169 | 11 | 13 | . 52 | 166 | . 04 | 3 | 3.61 | . 04 | . 14 | 1 | 31 |
| 103+00E 104+50N | 74 | 136 | 44 | 10 | . 9 | 12 | 10 | 346 | 6.78 | 13 | 5 | ND | 1 | 112 | 1 | 2 | 2 | 117 | . 06 | . 180 | 7 | 56 | 1.44 | 161 | . 07 | 2 | 2.67 | . 03 | . 25 | 1 | 330 |
| 103400E 104+00K | 67 | 203 | 19 | 67 | 1.1 | 1 | 13 | 265 | 8.15 | 4 | 5 | ND | 2 | 206 | 1 | 2 | 2 | 107 | . 04 | . 162 | 5 | 24 | 1.23 | 11 | . 05 | 2 | 3.00 | . 08 | . 5 | 1 | 290 |
| 103 400 E 103+50N | 17 | 70 | 47 | 64 | . 8 | 1 | 7 | 262 | 5.10 | 7 | 5 | KD | 1 | 71 | 1 | 2 | 4 | 45 | . 06 | . 170 | 1 | 27 | . 12 | 380 | . 03 | J | 2.22 | .03 | . 17 | 1 | 121 |
| 103+00E 103+00N | 5 | 21 | 7 | 36 | . 3 | 4 | 6 | 118 | 2.78 | 2 | 5 | $N 0$ | 1 | 24 | 1 | 2 | 2 | 68 | . 06 | . 074 | 6 | 21 | . 29 | 87 | . 02 | 3 | 1.4 | . 01 | . 04 | 1 | 53 |
| 103+00E 102+50M | 37 | 112 | 24 | 57 | . 5 | 12 | 7 | 221 | 4.67 | 4 | 5 | ND | 1 | 63 | 1 | 2 | 3 | 140 | . 04 | . 123 | 11 | 29 | . 76 | 145 | . 03 | 4 | 2.63 | . 01 | . 11 | 1 | 132 |
| 103+00E 102+00\% | 64 | 334 | 21 | 105 | 1.0 | 22 | 18 | 402 | b.11 | 7 | 5 | ND | 1 | 47 | 1 | 2 | 2 | 130 | . 15 | . 154 | 10 | 64 | 1.56 | 151 | . 07 | 5 | 3.67 | . 02 | . 30 | 1 | 240 |
| 103+00E $101+50 \mathrm{~K}$ | 26 | 208 | 20 | 12 | 1.1 | 13 | 14 | 501 | 6.4 | 4 | 5 | ND | 1 | 92 | 1 | - 2 | 2 | 140 | .17 | . 197 | 11 | 23 | 1.07 | 119 | . 07 | 3 | 3.73 | . 01 | . 21 | 1 | 150 |
| 103+00E 10! +00 N | 26 | 148 | 24 | 79 | . 1 | 15 | 14 | 402 | 6.02 | 5 | 5 | ND | 1 | 61 | 1 | 2 | 3 | 134 | . 10 | . 129 | 9 | 44 | 1.10 | 161 | . 04 | 4 | 3.28 | . 01 | . 19 | 1 | 115 |
| 103+00E 100450N | 87 | 391 | 9 | 94 | 1.6 | 11 | 21 | 103 | 7.23 | 10 | 5 | KD | 1 | 84 | 1 | 2 | 2 | 173 | . 23 | . 134 | 11 | 23 | 1.52 | 115 | . 12 | 2 | 4.16 | . 03 | . 3 | 1 | 510 |
| 103+00E 100+00K | 16 | 111 | 14 | 42 | . 5 | 10 | 12 | 378 | 4.41 | 3 | 5 | NO | 1 | 32 | 1 | 2 | 2 | 114 | . 01 | . 196 | 9 | 29 | . 77 | 99 | . 03 | 3 | 3.35 | . 01 | . 10 | 1 | 108 |
| 103+00E 99+50M | 20 | 66 | 32 | 35 | . 1 | 4 | 7 | 259 | 5.73 | 4 | 5 | HD | 1 | 27 | 1 | 2 | 3 | 138 | . 05 | . 117 | 9 | 17 | . 35 | 141 | . 04 | 2 | 1.79 | . 01 | . 07 | 1 | 132 |
| 103+00E 54+00N | 4 | 130 | 37 | 156 | . 8 | 11 | 12 | 481 | 3.77 | 12 | 5 | ND | 1 | 42 | 1 | 2 | 5 | 49 | . 28 | . 231 | 7 | 19 | 1.02 | 16 | . 01 | 4 | 3.22 | . 01 | . 05 | 1 | 220 |
| 103+00E 98+50N | 12 | 197 | 37 | 111 | 1.8 | 19 | 15 | 394 | 12.25 | 13 | 5 | ND | 1 | $1!$ | 1 | 2 | 2 | 90 | . 32 | . 262 | 11 | 110 | 1.85 | 64 | . 02 | 3 | 3.06 | . 02 | . 05 | 1 | 770 |
| 103+50E 100400K | 29 | 76 | 29 | 66 | . 4 | B | 10 | 390 | 9.25 | 14 | 5 | ND | 1 | 32 | 1 | 2 | 3 | 103 | . 05 | . 180 | 10 | 27 | . 67 | 148 | . 05 | 7 | 2.71 | . 01 | . 08 | 1 | 13* |
| STD C/AU-S | 22 | 58 | 39 | 134 | 6.9 | 74 | 30 | 1033 | 3.97 | 42 | 21 | 7 | 33 | 48 | 18 | 16 | 19 | 63 | . 48 | . 104 | 30 | 59 | . 1 | 180 | . 08 | 38 | 1.73 | . 06 | . 14 | 13 | 51 |

$=$
$=$
$=$
$=$
$=$
a

## 

 $104+400 \mathrm{E}$ 102＋50K104＋00E $102+00 \mathrm{~K}$ 1O6to0E 101＋50M 104＋00E $101+00 \mathrm{~N}$
$104+00 \mathrm{E}$ 100 50 K $104+00 \mathrm{E}$ 100＋00K $104+008$ E $99+501$
$104+00 E 99+00 \mathrm{~K}$
 105400E $104+50 \mathrm{~K}$
105400E $104+00 \mathrm{H}$高 105＋00E $103+00 \mathrm{~K}$
105 +00 E E 102 ＋50K 105500E 102400K敄亳 105＋00E $100+500 \mathrm{~K}$

105＋00E 99450x
 106＋400E 1065 10 OHN


| （1） | 를 |  | 웅웅우ㅇㅜㅐ앵 |  | 먹억욱웅윽 | 옿윽옹웅 염 |  | 윽웅 | 율 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $$ | ＝玉 | $\rightarrow$ | $\rightarrow$－－－ | ーーーーい | $\rightarrow \overrightarrow{-a}$ | m | ャーいー－ | ーーーーか | $\cdots$ |
|  | $\simeq m$ |  |  | $\because$ |  | MN | ¢ \％¢ ¢－ | 웅 | 덩클 |
|  | Prom | $\overrightarrow{\underline{0}} \overrightarrow{0} \dot{0}$ | 등으웅앙 |  | 항ㅎ |  | 등훙 | 흥ㅇ | 항․ |
|  | ar |  | 加合品品 <br> ウゥウ～～～ |  |  |  | 天留留 ヘヘッヴ | 구ㄱㅜㅜ | FF |
|  | $\cdots$ \＃ | $\rightarrow \pi N+N$ | いNMNM | NNNMm | Mmonm | WNMNN | NNMmM | ＊＊－＊ | Nem |
|  | $\approx ア$ | ¢ $9 \%$ \％ | 웅웅 |  | 둥훙훙 |  | 둥옹ㅇ․ | $\stackrel{\rightharpoonup}{8}$ 항 | $\bigcirc$ |
|  | 家空 | 上尔 |  |  |  | $\pm \infty$ |  | N以 | 江 8 |
| $\begin{aligned} & \infty \\ & \underset{\sim}{\alpha} \\ & \underset{\sim}{N} \\ & 1 \\ & 0 \\ & 0 \end{aligned}$ |  | 아ㅇㅜㅜํ |  |  | 응쿵 |  | 莫筞管 |  | ¢ |
|  | ¢ 즐 | NN以辺 |  | ＊rn | の以にぎ边 |  |  | －mm＝ | N |
|  | 3 | $6 n$ |  |  |  |  |  | Mmmea | 今湯 |
| $\underset{\sim}{\text { 山 }}$ | $\cdots m$ | 응훙웅웅 |  |  |  |  | 옹형용흥 응 | 옹웅 당 웅 | ¢ |
|  | $\overbrace{}^{m}$ | 흥흥 | 푿 ¢ ¢ ¢ |  | 영ㅎㅇㅇ | 끙끄․ |  |  | 웅 |
|  | $>$ 즐 | 以nom8 | 5 |  | がツFこ | らからNす | 으느ํ |  | 2 \％ |
|  | 用坔 | $N$ | $\infty$ |  |  |  | ＊の | NNM＊m | $\cdots$ |
|  | 会空 | nmenm | NNmmm | NmNNTN | NmNN | Nonme | nNNNN | NNNNN | ～ロ |
|  | ？픙 | －－－－ | $\rightarrow \infty-m+$ |  |  |  | －ーーNー |  | $\approx$ |
| 든 | 的至 | $\rightarrow \sim \sim \square$ | 글쭦 | Nㅓㄱ엉 |  | のーー玉年 |  | $\because$－－－ | $m=$ |
|  | 프졸 | －ーツNー | $N$ | $\rightarrow \mathrm{mmN}$ | $\rightarrow \rightarrow-\infty \times N$ | $m$ | $\mathrm{n} \mathrm{\rightarrow m}$ | ーーローか | $\cdots$ |
|  | 콫 | 봊무웄ํ |  | 으눖오읒오 |  | N显坴以是 | N웆이으응 |  | 9 ${ }^{\text {² }}$ |
|  | $=3$ |  |  | のぃぃぃぃ |  |  |  | いがいいか | $\cdots \times$ |
|  | $\cdots$ | Mronm | ソッチニ9 | \％ | のNonm | 으으が家 |  | $m m+n=$ | $\cdots$ |
|  | ＊${ }^{-1}$ |  |  |  | 가요응 | 示 8 名 <br>  |  |  $\cdots$ N～ | 5 |
|  | 독 촌 | $\wedge$ ヘッコ | 家争号号 | 里令活莴品 | －ッッ吅品 |  |  | 븍ำ先 | Fiot |
|  | 吅 졸 | $N m N \rightarrow N$ | $\cdots$ | 퍽ㅇ－M | ーNMール | m |  |  | $\cdots$ |
|  | 迷 | $\rightarrow-\infty$－ | － | $\cdots m$ Om－ |  |  |  | NnMmo | －2 |
|  | 星突 | サッツ\％ |  | $\cdots$ |  | 중 | $\because *$ | ？ | $\pm$ |
|  | 드을 | ーーの®～ | $=$ | －950 |  | \％ostis |  | ーッ゙ッジ | ת9 |
|  | 25 |  | \％¢ ¢ ¢ |  |  |  |  | キがNご | $\vec{\sim}$ |
|  | 3 | －Nニッ | 丰号面突家 |  | $\cdots$ ¢ $=$ ¢ |  |  |  | 50 |
|  | 을 |  | \％ 6 ¢ | $\underset{\sim}{\sim}-\operatorname{mon}$ | － | 込 으으우ํ | 畐MッーN | の士になに | 玉 |
|  |  |  |  |  |  |  | 긍 증 든 종 증 <br>  |  | 枈 |
|  | 总 |  |  |  |  |  |  |  | $\begin{aligned} & \text { 容空 } \\ & \text { 总导 } \end{aligned}$ |


| 登完 | 요웅ㅇㅇㅇ웅 | 운역욱앙 | 옹옹웅 | 웅웅웅웅 |  |  | 옹훙융 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| － | － | $\rightarrow$－－－－ | －ーーツ－ | ーーツーツ | ーーーが | ーーがー | \＃ |
| $x$ m | 응옹앙 |  |  | 흉力 | 훙융웅 | 항 |  |
| $\pm 0$ | 흥응 |  | 훙응웅 | 앙웅응 | $\vec{\square} \vec{\square} \vec{\square} \mathbf{\square}$ | \％ |  |
| $\geq 0$ |  ベーNヘN |  |  |  |  |  |  |
| －플 | MNMNN | N | $m$ | －NmNN | NonNm | －NNMN | NNNON |
| 汇 | ¢ | $\pm$ | ت |  |  |  | 훙흥둥 |
| 영 |  |  | ジ気乐 | 웅오윽 | 욱유N |  | － |
| 문 |  | $\underset{\sim}{2}$ |  | $\cdots$ | ¢on | 下～yNo |  |
| 놏츨 | $\cdots$－ |  | 回里的縕 | 为时 |  | 부N | Fの9か |
| 5 空 | $\underset{\sim}{\sim}=$ | $=$ | $m$ |  |  | ONr－m | m |
| a．$\quad$ er |  |  |  | 붕․․ | $\because \because \rightarrow$ |  |  |
| $\mathbf{4 n}^{m}$ | 으웅우ㅇㅜㅜㄹ |  | 응 |  | 옹옹웅 |  | 응훅푸 |
| ＞ 2 | N0 | あ心のが |  |  | 꽁ํㄱㄱ응 | $\because \sim \sim$ \％ |  |
| 콜 | $\cdots$ | N | $m$ | Noneromor | MnNmm | － | $\cdots \pm$ |
| 色童 | N | N | $N$ | N | $\sim$ | －NNNO | NNNME |
| 马趇 | $\cdots$ |  |  |  |  |  |  |
| 为 폴 |  | 억 |  | 以心め゙g | ぶ事か |  | 玉 |
| 上 | － |  | ーツーヅい |  |  |  | 9 |
| 3 | ${ }^{\sim}$ 웆 |  |  |  |  |  | 빈옺요울 |
| こ天 | $\cdots$ |  | $m$ | $n$ | のmmmm | $n$ | \％ |
| 辰坔 | $\bullet$ | $\cdots$ | $n$ | \＃$\%$ or | 以上円～＊ | カツジロ | 可以下吅 |
| $\underline{\square}$ | からが至 |  |  | 웅웅 |  |  |  |
| g 5 |  | 灾馬が |  |  |  |  |  |
| 8 |  |  | いのージへ | －＊ロが | $\cdots \infty \times m$ |  | －¢ 以 ¢ \％ |
| 或 플 | $\boldsymbol{\infty}$ | $\rightarrow \mathrm{m-Hm}$ |  |  |  | 응 | E |
| 오를 | －¢ | まツッツ | $\because \underset{\sim}{\square}$ | $\pm$ | － | － | 9 |
| 동․ | NOMNき | 戸ャッバ | ～～8 | 二三小第点 |  | $\rightarrow+2 n 5$ | ¢5－ |
| 은 | 戸玉がた | 馬的里朿 | 퐁N | 令为以等 |  |  | \％ 988 |
| 3 3 | №wNN | 융％M |  |  | 成动以の留 | ツNさ渃以 | NN馬 |
| 믄츨 |  | m－89 | カロロー尺 |  |  |  | $\cdots$ 「N |
|  |  |  |  |  |  |  |  |
| 岂 | 容岁容岩岩 <br>  |  |  |  |  |  |  |

＂：

흥응。


$$
\begin{aligned}
& \because r \\
& \approx= \\
& \approx=
\end{aligned}
$$

2
$\stackrel{8}{2}$
－
$\omega 0 \mathrm{NOM}$
읍

音
$M N+m$
$\stackrel{5}{5}$
ㄹ $\rightarrow \quad$

$$
\approx
$$

플

马
的
ざェーローか

$\infty=\infty$

 on
$-9$

カカッツロ

융웅훅요
풍섯으응 끈ํㅇㅇ
 Mッロジ ロッビッ $-\infty+$ MNMm $\rightarrow \cdots+$ $\rightarrow-\rightarrow$

$$
=2
$$

$$
\check{z}
$$

$$
\begin{aligned}
& \therefore \\
& \text { s } \\
& 8
\end{aligned}
$$

$$
\begin{aligned}
& \text { 돈 } \\
& 8 \\
& 8
\end{aligned}
$$

$$
8
$$

을은ニ $ニ$～管ニ゚ーシ을3 苇훈
111＋00E 107＋00K$1111+00 \mathrm{E}$ 106＋50K
$111+00 \mathrm{E}$ 106 +0 OK$111+00 \mathrm{E}$
$111+005+50 \mathrm{~K}$
$105+00 \mathrm{~K}$$11 i+00 E$ 104＋50N
$41+00 E$ 104＋00N I1＋00E 104＋00N $11+00 \mathrm{E}$ 103 +00 H III＋00E 102450K

It $1+00 \mathrm{E}$ 102＋00K 11＋00E 101＋50\％ $11+00 \mathrm{E} 101+00 \mathrm{H}$ 12＋00E $106+50 \mathrm{~K}$ 112＋00E 106＋00N
 がッニッ ぶあ ロ ベッジッ $m o m m$ 122400E $105+50 \mathrm{H}$ $12+005$ 105＋00K 122＋00E 104＋50H $112+00 \mathrm{E}$ 104＋00K
$112+00 \mathrm{E}$ 103＋50K $12+00 \mathrm{E} 103+00 \mathrm{~N}$
$112+00 \mathrm{E}$ 102 50 K 112＋00E 102＋50K $112+00 \mathrm{E}$ 101＋50N $122+00 \mathrm{E}$ 101＋00K
 $112+50 \mathrm{E}$ 102＋00N
$113+00 \mathrm{E}$
$106+00 \mathrm{~N}$ $113+00 \mathrm{E} 106+00 \mathrm{~N}$ 113＋00E 105＋00N II3＋00E $104+50 \mathrm{~K}$ $113+00 \mathrm{E} 104+00 \mathrm{~K}$
$113+00 \mathrm{E}$
$103+50 \mathrm{~N}$


 훈
$=$


옹ㅇㅇㅇ
옥옹․․ $\rightarrow-\rightarrow-$

윽걱웅 シーツ゚ $\rightarrow-\infty-\cdots$ $=\infty$ 웃 응 웅
$\qquad$
 옹응능능 $\underset{9}{\circ}$ 옹옹 훙흥․․ ～～が
 응옹ㅇㅇㅇ
옹 옹 응
莫约留은置恕管ががすN N N 융皿号

## r

 $\infty$
융욱N꾸N$=$

$\mathrm{N}+\mathrm{m}$
$0 N-N$

픙흐옹걱
웅흥응 봉

$$
s
$$

푸오윾믐 동응응

ジッジ NNMNN
$\qquad$ NHNM
$\qquad$오옹응完宫品옄ㅍㅍ园に気응Nㅋ을禺－88

우ㅈㅜㅜ오웆요
뭊문 울훚
$\omega$

园
，
웃우ㄹㅜㅜ울

운 옾오
an win in

いまの

충Nㅜㄹ
든
三恩
さ～シ $\qquad$

6 웅

$\pm \boxed{N-m}$
－ー ツ


MMNG
MMr Mr
$m \mathrm{~m}$

M道
京＂清

$\Rightarrow \vec{m}$
믈
플
은 졸
14400 E
$106+00 \mathrm{~N}$
$14+00 \mathrm{E}$
$105+50 \mathrm{~N}$
$14+00 \mathrm{E}$
$105+00 \mathrm{~N}$
$114+00 \mathrm{E}$
$104+50 \mathrm{~N}$
$14+00 \mathrm{E}$
$104+00 \mathrm{~N}$
114＋00E $103+50 \mathrm{~N}$ $114+00 \mathrm{E}$ 105 +00 K $114+00 \mathrm{E} 102+50 \mathrm{H}$ 105＋50N 114＋50E范 105＋000 114＋50E



㟔
 $104+00 \mathrm{~K} 104+50 \mathrm{E}$ 104＋00K $110+50 \mathrm{E}$㟶陁
 1O3 5 50N $100+50 \mathrm{E}$ 103＋50N $101+50 \mathrm{E}$容容容 $103+50 \mathrm{~K} 108+50 \mathrm{E}$ 103＋50H 109＋50E 103＋50N $110+50 \mathrm{E}$ $103+50 \mathrm{~N} 111+50 \mathrm{E}$ 103 $+50 \mathrm{H} 114+50 \mathrm{E}$
$103+00 \mathrm{~K} 99+50 \mathrm{E}$ 103＋00N 100＋50E STD C／ALUS

|  | C.E.C. ENGINEERING |  |  |  |  |  |  |  |  |  |  | FFOUJECT |  |  | P86-1 |  | YEMMESS |  |  | FILE \# 86-2918 |  |  |  |  | $\begin{array}{r} \mathbf{I}_{1} \\ \mathbf{I} \end{array}$ | $\begin{array}{r} \text { PR } \end{array}$ | $\begin{array}{r} A! \\ Z \end{array}$ | $\begin{gathered} \mathrm{Na} \\ \mathrm{I} \end{gathered}$ | PAGE |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SARPLEt | Mo <br> PPh | $\begin{array}{r} \mathrm{Cu} \\ \mathrm{PPM} \end{array}$ | Pb <br> PFK | $\begin{array}{r} \text { In } \\ P P n \end{array}$ | $\begin{gathered} A g \\ P P K \end{gathered}$ | $\begin{gathered} \mathrm{H}_{2} \\ \mathrm{PPR} \end{gathered}$ | $\begin{gathered} \text { Ko }^{\text {PPM }} \end{gathered}$ | $\begin{gathered} \mathrm{Mn} \\ \text { PPM } \end{gathered}$ | $\begin{gathered} \mathrm{Fe} \\ \mathrm{Z} \end{gathered}$ | As <br> PPM | $\underset{\text { PP }}{\mathbf{U}}$ | $\begin{gathered} \text { Au } \\ \text { PPM } \end{gathered}$ | $\begin{aligned} & \text { Th } \\ & \text { PPM } \end{aligned}$ | Sr PPM | $\begin{gathered} \text { Co } \\ \text { PPK } \end{gathered}$ | $\begin{gathered} \text { Sb } \\ \text { PPM } \end{gathered}$ | $\begin{array}{r} \text { D1 } \\ \text { PPM } \end{array}$ | $\begin{array}{r} V \\ \text { PRK } \end{array}$ | $\begin{gathered} \mathrm{Ca} \\ \mathrm{I} \end{gathered}$ | $\begin{aligned} & p \\ & \chi \end{aligned}$ | $\begin{gathered} \text { La } \\ \text { PM } \end{gathered}$ | Cr PPR | $\begin{gathered} \mathrm{Mg} \\ \mathrm{I} \end{gathered}$ | $\begin{array}{r} \mathbf{H} \\ \text { PPK } \end{array}$ |  |  |  |  | $\begin{aligned} & \mathbf{X} \\ & \mathbf{Z} \end{aligned}$ | \% ${ }_{\text {\% }}$ | $\begin{aligned} & \text { Aut } \\ & \text { PPE } \end{aligned}$ |
| 103+00N 101+50E | 11 | 146 | 35 | 55 | 1.5 | 9 | 10 | 217 | 5.34 | 6 | 5 | ND | 1 | 43 | 1 | 2 | 5 | 98 | . 05 | . 144 | 7 | 22 | . 52 | 213 | . 03 | 3 | 3.30 | . 01 | . 16 | 1 | 91 |
| 103+00K 102+50E | 7 | 2686 | 25 | 1 | . 1 | 1 | 13 | 111 | 47.71 | 22 | 5 | ND | 2 | 4 | 3 | 2 | 2 | 2 | . 02 | . 060 | 28 | 1 | . 07 | 1 | . 01 | 2 | . 54 | . 01 | . 02 | 1 | 16 |
| 103+00K 103+50E | 1 | 34 | 21 | 56 | . 4 | 6 | 6 | 365 | 2.75 | 2 | 5 | ND | 1 | 78 | 1 | 2 | 3 | 76 | . 10 | . 065 | 3 | 23 | . 46 | 164 | . 07 | 2 | 2.03 | . 01 | . 09 | 1 | 230 |
| 103+00N 104t50E | 35 | 27 | 17 | 17 | . 5 | 2 | 2 | 56 | 2.10 | 2 | 5 | KD | 1 | 17 | 1 | 2 | 5 | 54 | . 03 | .066 | 6 | 10 | . 26 | 41 | . 05 | 2 | . 17 | . 01 | . 05 | 1 | 9 |
| 103+00K $108+50 \mathrm{E}$ | 108 | 55 | 30 | 78 | . 7 | 11 | 8 | 414 | 10.40 | 12 | 5 | ND | 2 | 4 | 1 | 2 | 13 | 135 | . 03 | . 124 | 4 | 70 | 1.86 | 25 | . 01 | 2 | 2.47 | . 01 | .03 | 1 | 880 |
| 103+00 $109+50 \mathrm{E}$ | 27 | 85 | 146 | 105 | 1.9 | 11 | 7 | 577 | 5.18 | 31 | 5 | KD | 1 | 46 | 1 | 2 | 6 | 101 | . 15 | . 173 | 7 | 37 | 1.42 | 49 | . 07 | 2 | 2.81 | . 01 | . 06 | 1 | 250 |
| $103+00 \mathrm{M} 110+50 \mathrm{E}$ | 13 | 39 | 18 | 76 | . 3 | 16 | 5 | 315 | 4.97 | 12 | 5 | HD | 1 | 19 | 1 | 2 | 3 | 88 | . 01 | . 089 | 6 | 67 | 1.43 | 35 | . 04 | 2 | 2.13 | . 01 | . 03 | 1 | 200 |
| 103+00H 111+50E | 12 | 132 | 91 | 148 | 1.5 | 9 | 13 | 662 | 9.30 | 25 | 5 | ND | 1 | 91 | 1 | 2 | 6 | 123 | . 24 | . 207 | 2 | 30 | 1.27 | 160 | . 13 | 2 | 3.14 | . 02 | . 09 | 1 | 156 |
| 103+00N 113+50E | 2 | 93 | 16 | 161 | . 6 | 9 | 13 | 950 | 5.96 | 19 | 5 | ND | 1 | 96 | 1 | 2 | 7 | 90 | . 78 | . 160 | 5 | 14 | . 86 | 217 | . 05 | 2 | 4.11 | . 01 | . 07 | 1 | 220 |
| 102+50H 99+50E | 16 | 417 | E | 89 | . 4 | 14 | 20 | 447 | 6.43 | 2 | 5 | HD | 1 | 74 | 1 | 2 | 6 | 153 | . 01 | .181 | 7 | 32 | 1.62 | 351 | . 07 | 2 | 4.18 | . 03 | . 50 | 1 | 230 |
| 102+50K 100+50E | 19 | 216 | 10 | 51 | . 6 | 1 | 14 | 704 | 8.13 | 4 | 5 | KD | 1 | 55 | 1 | 2 | 5 | 164 | . 05 | . 334 | 3 | 28 | 1.17 | 240 | . 03 | 2 | 3.24 | . 03 | . 25 | 1 | 99 |
| 102+50 ${ }^{\text {C }}$ 101+50E | 70 | 221 | 16 | 10 | . 5 | 6 | 10 | 200 | 4.55 | 1 | 5 | KD | 1 | 65 | 1 | 2 | 5 | 52 | . 04 | . 114 | 13 | 12 | 1.04 | 180 | . 03 | 2 | 2.97 | . 02 | . 27 | 1 | 190 |
| 102+50N 102+50E | 2 | 1899 | 2 | 5 | . 9 | 4 | 3 | 29 | . 36 | 2 | 5 | ND | 1 | 7 | 1 | 2 | 2 | 5 | . 04 | . 324 | 3 | 5 | . 04 | 12 | . 01 | 2 | 2.11 | . 01 | . 01 | 1 | 114 |
| 102+50N 103+50E | 11 | 1572 | 12 | 45 | . 7 | 9 | 4 | 119 | 2.34 | 2 | 5 | KD | 1 | 19 | 1 | 2 | 3 | 19 | . 24 | . 196 | , | 12 | . 29 | 29 | . 01 | 2 | 2.16 | . 01 | . 04 | $!$ | 56 |
| 102+50N 104450E | 40 | 46 | 11 | 45 | . 1 | 5 | 4 | 141 | 2.96 | 2 | 5 | ND | 1 | 25 | 1 | 2 | 4 | 78 | . 03 | . 127 | 8 | 12 | .94 | 14 | . 01 | 2 | 2.53 | . 01 | . 05 | 1 | 340 |
| 102+50k 109+50E | 73 | 52 | 34 | 76 | . 6 | 18 | 6 | 442 | 8.12 | 22 | 5 | ND | 1 | 17 |  | 2 | 9 | 121 | . 03 | . 130 | 4 | 107 | 2.41 | 31 | . 03 | 2 | 2.64 | . 01 | . 03 | 1 | 390 |
| 102+50N 109+50E | 17 | 59 | 33 | 26 | 2.9 | 1 | 4 | 139 | 2.41 | 11 | 5 | ND | 1 | 17 | 1 | 2 | 5 | 43 | . 05 | . 148 | 3 | 14 | . 29 | 56 | . 01 | 2 | 1.43 | . 01 | . 03 | 1 | 182 |
| 102+50K 110450E | 17 | 20 | 10 | 46 | . 3 | 5 | 3 | 154 | 3.55 | 3 | 5 | Nid | 1 | 6 | 1 | 2 | 4 | 43 | . 02 | . 042 | 5 | 13 | 1.34 | 17 | . 01 | 2 | 1.18 | . 01 | . 01 | 1 | 165 |
| 102450M 111+50E | 10 | 124 | 67 | 112 | 1.5 | 8 | 14 | 157 | 11.27 | 30 | 5 | ND | 1 | 107 | 1 | 2 | 1 | 153 | . 34 | . 210 | 2 | 37 | 1.73 | 138 | . 18 | 2 | 3.26 | . 02 | . 08 | 2 | 300 |
| 102+50M 113450E | 2 | 112 | 65 | 142 | 1.0 | 9 | 1 | 452 | 3.97 | 11 | 5 | ND | 1 | 46 | 1 | 2 | 1 | 14 | . 37 | . 155 | 3 | 58 | 1.49 | 39 | . 11 | 2 | 3.32 | . 01 | .03 | 1 | 36 |
| 102+00N 77+50E | 4 | 207 | 34 | 69 | 1.8 | 10 | 14 | 453 | 5.99 | 4 | 5 | KD | 1 | 117 | 1 | 2 | 12 | 78 | . 21 | . 141 | 1 | 19 | . 52 | 314 | . 02 | 4 | 3.86 | . 02 | . 18 | 2 | 12 |
| 102+00N 94+50E | 14 | 277 | 20 | 52 | . 8 | 7 | 15 | 297 | 5.11 | 2 | 5 | ND | 1 | 62 | 1 | 2 | 7 | 131 | . 06 | . 155 | 5 | 29 | . 94 | 271 | . 03 | 2 | 3.45 | . 02 | . 26 | 3 | 350 |
| 102400K 100+50E | 1 | 157 | 15 | 42 | . 4 | 1 | 9 | 217 | 4.13 | 3 | 5 | KD | 1 | 40 | 1 | 2 | 5 | 90 | . 04 | . 149 | 7 | 20 | . 71 | 217 | . 02 | 2 | 2.63 | . 02 | . 15 | 2 | 121 |
| 102400N 101+50E | 31 | 420 | 17 | 110 | . 4 | 11 | 20 | 562 | 7.55 | 2 | 5 | ND | 1 | 161 | 1 | 2 | 4 | 169 | . 21 | . 204 | 1 | 26 | 1.03 | 205 | . 08 | 2 | 5.32 | . 02 | . 30 | 1 | 230 |
| 102400K 102+50E | 26 | 301 . | 23 | 11 | . 4 | 12 | 15 | 338 | 5.24 | 6 | 5 | K0 | 1 | 45 | 1 | 2 | 1 | 135 | . 12 | . 119 | 7 | 26 | 1.44 | 137 | . 07 | 2 | 3,78 | . 02 | . 37 | 1 | 130 |
| 102+00K 103+50E | 4 | 193 | 2 | 21 | . 4 | 5 | 10 | 44 | . 37 | 2 | 5 | ND | 1 | 44 | 1 | 2 | 2 | 3 | 1.11 | . 110 | 2 | 3 | . 04 | 1 | . 01 | 2 | . 49 | . 01 | . 04 | 1 | 25 |
| 102+00N 104+50E | 85 | 158 | 32 | 04 | 1.2 | 9 | 10 | 421 | 6.41 | 4 | 5 | kD | 1 | 42 | 1 | 2 | 7 | 103 | . 06 | . 191 | 7 | 21 | 1.51 | 122 | . 01 | 2 | 2.67 | . 02 | . 12 | 1 | 360 |
| 102400K 101450E | 107 | 28 | 25 | 48 | . 5 | 10 | 3 | 243 | 7.22 | 9 | 5 | NO | 1 | 15 | 1 | 2 | 4 | 69 | . 01 | . 076 | 7 | 54 | 1.75 | 33 | . 01 | 1 | 1.95 | . 01 | . 05 | 2 | 510 |
| 102+00N 109+50E | 36 | 145 | 270 | 137 | 14.6 | 10 | 12 | 502 | 7.31 | 52 | 5 | KD | 1 | 66 | 1 | 2 | 5 | 131 | . 12 | . 170 | 3 | 34 | 1.00 | 124 | . 04 | 2 | 2.43 | . 02 | . 09 | 1 | 310 |
| 102+00K 110+50E | 37 | 46 | 29 | 13 | . 5 | 4 | 5 | 219 | 5.10 | 12 | 5 | H1 | 1 | 14 | 1 | 2 | 4 | 70 | . 05 | . 068 | 9 | 15 | 1.02 | 3 | . 02 | 2 | 1.74 | . 01 | . 03 | 1 | 157 |
| 102+00N 111+50E | 14 | 74 | 47 | 127 | . 5 | 9 | 1 | 467 | 9.32 | 23 | 5 | ND | 1 | 53 | 1 | 2 | 7 | 170 | . 15 | . 226 | 2 | 49 | 2.00 | 93 | . 09 | 2 | 2.09 | . 01 | . 05 | 2 | 230 |
| 101+50N 97+50E | 5 | 149 | 23 | 6 | . 5 | 10 | 13 | 410 | 5.11 | 4 | 5 | MD | 1 | 80 | 1 | 2 | 8 | 71 | . 12 | . 144 | 7 | 16 | . 55 | 215 | . 02 | 1 | 3.05 | . 01 | . 12 | 1 | 53 |
| 101+50K 98+50E | 4 | 192 | 31 | 78 | . 3 | 11 | 24 | 987 | 5.62 | 2 | 5 | ND | 1 | 71 | 1 | 2 | 11 | 62 | . 47 | . 194 | 4 | 18 | . 62 | 402 | . 01 | 1 | 2.30 | . 01 | . 16 | 1 | 106 |
| 101+50N 49+50E | $2!$ | 212 | 16 | 70 | 1.0 | 9 | 14 | 352 | 6.17 | 5 | 5 | ND | 1 | 66 | 1 | 2 | 4 | 129 | . 14 | . 191 | 9 | 29 | 1.56 | 197 | . 05 | 2 | 4.01 | . 02 | . 45 | 1 | 290 |
| 101+50M 100+50E | 4 | 70 | 5 | 21 | 2.1 | 4 | 4 | 13 | 1.65 | 2 | 5 | ND | 1 | 19 | 1 | 2 | 2 | 22 | . 06 | . 272 | 5 | 9 | . 14 | 52 | . 01 | 3 | 3.45 | . 01 | . 04 | 2 | 49 |
| 101+501 101+50E | 38 | 252 | 18 | 117 | 1.0 | 14 | 15 | 341 | 8.46 | 2 | 5 | ND | 1 | 66 | 1 | 2 | 2 | 198 | . 08 | . 150 | 3 | 26 | 1.12 | 252 | . 14 | 3 | 4.36 | . 02 | . 71 | 1 | 151 |
| STO C/AU-S | 20 | 57 | 38 | 131 | 6.9 | 67 | 27 | 937 | 3.97 | 39 | 20 | $B$ | 33 | 47 | 17 | 15 | 15 | 61 | . 41 | . 103 | 34 | 58 | . 88 | 176 | . 08 | 3 | 1.75 | . 06 | . 13 | 12 | 50 |


우푸우웅
홍홍ㅇㅇ
$0 \rightarrow$
픙훌․․
옹용
 を



各禺禺
 む

3
ar
－

3

$$
\begin{aligned}
& \text { in 줄 } \\
& \approx=
\end{aligned}
$$

ミタッミ』 －－ー・

를 ＝

$$
\begin{aligned}
& \text { 를 } \\
& \vdots
\end{aligned}
$$

코즌
コニコニ

올

## 들

## 4年

苋

101450N 10240E
 101＋50K 104＋50E 101＋00N $97+50 E$

101＋00K $97+50 E$ 101＋00N 99＋50E | 101＋00 |
| :--- |
| $101+00 \times 100+50 E$ | 101＋00N $101+50 \mathrm{E}$

$101+0011$
$102+50 \mathrm{E}$ $101+00 \mathrm{H}$ 103 150 E 101＋00K 104450E

 101＋00\％111＋50E $100+5011$ 47＋50E
$100+5011$ 4！ 450 E
 100＋50K 100＋50E 100＋5011 101450E

 100＋50K $10 \mathrm{H}+50 \mathrm{E}$

974501 97＋50E | 炭 |
| :---: |
| 高 |
| 管 | $94+50 \mathrm{M} 103+50 E$ $97+50 \% 104+50 \mathrm{E}$

## APPENDIX II

Acme Analytical Laboratories Ltd. Certificate of Analysis - Aock Samples

ACME ANALYTICAL LABORATDRIES LTD.
852 E. HASTINGS ST. VANCOLUVER B.C. VGA 1R6 PHONE 253-3158 DATA LINE 251-1011

DATE RECEIVED: SEPI 131986
DATE REPGRT MAILEDz
. 500 GRAM SAHPLE IS DIGESTED MITH JKL 3 -I-2 HCL-HHOJ-H2O AT 9S DEG. C FDR ONE HOUR AND IS DILUTED TD 10 ML MITH MATER.
 - SAMPLE TYPE: CORE AUI AMAYYSIS gY AA FROM 10 GRAM SAMPLE.

ASSAYER:
ng yis jy as froh 10 grah sampli ASGAYER: No olfft.DEAN C.E.C.ENGINEERING

FROJECT-KEMESS
PB6-19
FILE\#86-3634
FAGE 1


| SAMPLE\# | Mo FFM | $\begin{array}{r} \mathrm{Cu} \\ \mathrm{FFM} \end{array}$ | F' FFM | $\begin{array}{r} \mathrm{Zn} \\ \mathrm{FFM} \end{array}$ | Ag FFM | $\begin{aligned} & \mathrm{As} \\ & \mathrm{FFM} \end{aligned}$ | Au* <br> FFE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 8t-19-3? | 11.3 | 1675 | 5 | 53 | 1.0 | 4 | 340 |
| 86-19-38 | 280 | 1080 | 10 | ¢0) | . 6 | 2 | 230 |
| 86-19-39 | 100 | 1826 | 7 | 46 | 1.1 | 8 | 3.30 |
| 86-19-40 | 275 | 2255 | ? | 67 | 1.5 | 2 | 530 |
| 8t-19-41 | 185 | 14.37 | 16 | 60 | . 9 | 3 | 250 |
| 86-10-42 | 56 | 1072 | 14 | 61 | . 6 | 3 | 115 |
| 86-19-43 | 362 | 14.36 | 6 | 54 | . 8 | 2 | 142 |
| 86-19-44 | 50 | 1014 | 5 | उi | . 6 | 5 | 02 |
| 86-19-45 | 73 | 1.393 | 9 | $40^{\circ}$ | . 6 | 3 | 210 |
| 86-19-46 | 163 | 1772 | 13 | 52 | . 9 | 2 | 230 |
| É-19-47 | 23 | 1090 | 11 | 40 | . 6 | 4 | 220 |
| 86-19-48 | 18 | 854 | 12 | 72 | . 6 | 3 | 49 |
| 86-19-4? | 147 | 789 | 8 | 32 | . 5 | 3 | 87 |
| 86-19-50 | 17 | 359 | 6 | 16 | . 2 | 3 | 47 |
| 66-19-5. 1 | 13 | 8.37 | 9 | 58 | . 6 | $\theta$ | 42 |
| 86-19-52 | 20 | 678 | 18 | 64 | . 6 | 6 | 40 |
| 86-10-53 | 10 | 774 | 8 | 77 | . 6 | 7 | 32 |
| 86-19-54 | 27 | 711 | 19 | 69 | . 6 | 6 | 37 |
| 86-19-55 | 1 | 157 | 15 | 62 | . 2 | 5 | 20 |
| 86-19-56 | 19 | 559 | 10 | 113 | . 6 | 8 | 50 |
| 86-19-57 | 10 | 19.3 | 13 | 39 | . 2 | 5 | 47 |
| 86-19-58 | 26 | 161 | 19 | 49 | . 2 | 5 | 18 |
| 96-19-59 | 6 | 370 | 23 | 78 | . 5 | 8 | 42 |
| 86-19-50 | 15 | 351 | 16 | 46 | . 3 | 13 | 44 |
| 86-19-61 | 7 | 123 | 28 | 41 | . 1 | 18 | 19 |
| 86-19-62 | 4 | 328 | 19 | 96 | . 4 | 17 | 31 |
| 8t-10-6.3 | 5 | 5.34 | 19 | 137 | . 7 | 21 | 83 |
| 86-19-64 | 2 | 367 | 15 | 179 | . 7 | 38 | 34 |
| 86-19-65 | 2 | 475 | 23 | 144 | . 8 | 12 | 66 |
| 86-19-60 | 4 | 470 | 16 | 122 | . 7 | 17 | 35 |
| STD C/AU-R | 20 | 59 | 42 | 129 | 6.9 | 39 | 500 |

ACME ANALYTICAL LABDRATORIES LTD.















## APPENDIX IV

Geastatistics for the 1986 Lithogeochemical Survey





${ }_{78}^{42}$






















DRILL CORE RECOVERY





| FROM | TO | GETTY MINES, LIMITED DRILL HOLE LOG |  |  |  | Hole Number |  |  | $K-76 \div 4$ |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  | : |  |  |
|  |  | DESCRIPTION | SAMPLE NUMBER | FOOTAGE |  | $\begin{aligned} & \text { CORE } \\ & \text { LGTH } \end{aligned}$ | ASSAY |  |  |  |  |
|  |  |  |  | FROM | TO |  | cu\% | M0\% | (00\% ${ }_{\text {TTen }}$ | ${ }^{\text {a }}$ |  |
|  |  | Elvecits contrivet ta be commen. |  |  |  |  |  |  |  |  |  |
|  |  | Hematip eccus in somp veins mpenetio still common. |  |  |  |  |  |  |  |  |  |
|  |  | Preite coatent peobably derreosing sligity.._: |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 871' | 275. | EELD SPRR HORNBLENDE PORPHVEY DYLE |  |  |  |  |  |  |  |  |  |
|  |  | very sbap contocts. |  |  |  |  |  | - |  |  |  |
|  |  | The mopecity of the phenocgutc ore feldseer. |  |  |  |  |  |  |  |  |  |
|  |  | A coyple of fluacit veiac. |  |  |  |  |  |  |  |  |  |
|  |  | K-spar commen in ploces - espocialle bemtering veiss. |  |  |  |  |  | $=$ |  | : |  |
|  |  |  |  |  |  |  |  |  | : |  |  |
|  |  | some mognetite veining.. |  |  |  |  |  |  |  |  |  |
| 875' | $887.5^{\prime}$ | FINE GRAINER PLAELOCLOSE PSPPHYRY ANOESITE |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | lotsite. Eo general the adeneçusts are unaciented... |  |  |  |  |  |  |  |  |  |
|  |  | preite and chatepgeite ocuve in guatz veins andas dissemimatiois. |  |  |  |  |  |  |  |  |  |
|  |  | Strengly megentic. |  |  |  |  |  |  |  |  |  |
| $887.5^{\circ}$ | $890^{\circ}$ | EELOSPAR Heanblente parehygy dyte |  |  |  |  |  |  |  |  |  |
|  |  | mixed with finis enoined andeste. |  |  |  |  |  |  |  |  |  |
|  |  | eppeers to be a noer vertical contoct. |  | . |  |  |  |  |  |  |  |
|  |  | Bect similoo to pleviously but locting k-soen |  |  |  |  |  |  |  |  |  |
|  |  | Chokepucite abuadent in phass. |  |  |  |  |  |  |  |  |  |
|  |  |  | . |  |  |  |  |  |  |  |  |
| 890. | 1012: | ALTERED AUFITE POREHYRY ANDESITE |  |  |  |  |  | . |  |  |  |
|  |  | Quacte reioing emmon some endxotite veins alse eccues.: |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Avacte phenocrusts distinat in seme olaces and almast inxisible |  |  |  |  |  |  |  |  |  |
|  |  | in athers. . . . . |  |  |  |  |  |  |  |  |  |
|  |  | Pruite content seems_te hove decreased sighily devin the hale | . |  | . |  |  |  |  |  |  |
|  |  | while chalcogructe has inereased. |  |  |  |  |  |  |  |  |  |
|  |  | megnetit keinug common |  | $\therefore \cdot$ |  |  |  |  |  |  |  |
|  |  | mop in places - e.9 gos. |  |  |  |  |  |  |  |  |  |


|  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Page.. ${ }^{\text {a }}$. |  |  |  |  |  |  |  |  |  |  |
| from | то | GETTY MINES, LIMITED <br> DRILL HOLE LOG |  |  |  | Holc Number |  |  | K-76-4 |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  | description | ${ }_{\text {Stample }}^{\text {SUMER }}$ | FOO |  | Core |  |  | ${ }^{\text {ASSAY }}$ | , |
|  |  |  |  |  | T |  | ${ }_{\text {cu \% }}$ | мо\% | (0,7 7 m). |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  | cre axis |  |  |  |  |  | : |  |  |
|  |  | Sothom of the hele. |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  | . |  |  |  |  |  |  |  |  |
|  |  | - |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | $\because$ |  |  |
|  |  | -- - - |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | : |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |





| GETTY MINES, LIMITE |  |  |  |  | ole Nu | mber |  | 76:5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DRILL HOLE LOG |  |  |  |  |  |  |  | $1!$ |
|  | SAMPLE | FOOT | AGE | CORE |  |  | ASSAY | ! |
| DESCRIPTION | NUMBER | FROM | TO | LGTH | Cu\% | Mo \% |  |  |
| Fractures cemmanty at $80^{\circ}-90^{\circ}$. | 4302 | 630 | 640 |  | . 172 | 7.006 | 13 | $0 / 7$ |
| chakopurite oppean to be more abunobot (still $\leq 1$ to. loccuring | 4203 | 640 | 650 |  | 148 | f |  |  |
| as dusieminated specks and blebs with preite in gypoum | 4304 | 650 | 660 |  | 245 | .010 | 14 | 018 |
| and guarte veios. | 4205 | 660 | 670 |  | 191 | ?,009 | 12 | . 007 |
| Pyrite oceurs primacily ar stringerr and fiae dusimmatiens | 4206 | 670 | 680 |  | . 178 | 3 |  |  |
| Magnetite eccurs as trogmentis in guarts and dessemimatad in | 4207. | 680 | 690 |  | 222 | :007 | 10 | 012 |
|  |  |  |  |  |  |  |  |  |
| 404'- goupe |  |  |  |  |  |  |  |  |
| 408' - speek of mofy |  |  |  |  |  |  |  |  |
| $418^{\prime}=125^{\prime}$ No core |  |  |  |  |  |  | : |  |
| Areas of lacally aphooitio endesito |  |  |  |  |  |  |  |  |
| 431.5' - strmgers of hematite in guartz. |  |  |  |  |  |  |  |  |
| chakopyrite appears to be more ebundent from 170' to 550' |  |  |  |  |  |  |  |  |
| and apnears mainly as blebs in aibyolute (?) veins. |  |  |  |  |  |  |  |  |
| 491-982' Aabydrute (?) vein Cares, crystollio , $\mathrm{Ht}=3$, goed | . |  |  |  |  |  |  |  |
| clegrage) coataining blebr of chatogurcter, praite on' nopoetite |  |  |  |  |  |  |  |  |
| 506.5"- $1 / 2$ "foull goupe ait 50 .. |  |  |  |  |  |  |  |  |
| 5i3'-slip surface at $30^{\circ}$ |  |  |  |  |  |  |  |  |
| After ste gxasum veian up to $1 / 2$ thet and at voruable |  |  |  |  |  |  |  |  |
| ongler sporal. The oxpsum contoios no minerolization. |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 593 '-611' Pisk zeelix veining ond floading are ahundant. |  |  |  |  |  |  |  |  |
| Gypsum and anbydute veining at candoon angler still common- |  |  |  |  |  |  |  |  |
| after beo'. | . |  |  |  |  |  |  |  |
| $622.5^{\prime}-1 / 2{ }^{\text {N frespor vein at } 20 .}$ |  |  |  |  |  |  |  |  |
| Magnetite veloing is becooung more abundent with denth Venid |  |  |  |  |  |  |  |  |
| vary from microviculats to stringers in anhydrite and gypsum- |  |  |  |  |  |  |  |  |
| Fracturing vories from $90^{\circ}$ te $30^{\circ}$ |  |  | . |  | . |  |  |  |
| Pyrute eceurs moialy as veinlets. locally as olissminotioins |  |  |  |  |  |  |  |  |
| 6ee'-650' pruit content about 110 |  |  |  |  |  |  |  |  |
| 652.5'-6.56' Silicified with K-sper fleading |  |  |  |  |  |  |  |  |
| Pyiste and ohakopurite becoming less ahondany with depoth, chakopurith |  | . |  |  |  |  |  |  |
| SEill accueing as small bker in oxeite veintete. |  |  |  |  |  |  |  |  |












| $$ |  | 0 | Win | $0{ }^{100}$ | $0 \begin{array}{ll}N & n \\ 0\end{array}$ | N00 | N0 | $0^{\circ}$ | No | 00 | 80 | 0. $0_{0} 0$ | 0 | 48 | $\bigcirc$ | 0 |  |  | on | 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & 0 \\ & 0 \\ & 0 \\ & 0 \end{aligned}$ | $\infty 0$ | $0$ | $\therefore \therefore 0$ |  |  |  | 0 | 0 | 0 | $0{ }^{\circ}$ | $\begin{aligned} & 0 \\ & 0 \end{aligned}$ |  | 0 | in | $\stackrel{0}{8}$ |  |  | 0 | 0 |
| $z{ }^{2}$ | $0$ | $\underset{N}{\infty}$ | $\begin{aligned} & N \\ & \text { n } \end{aligned}$ | N |  |  |  | ${ }^{N}$ | ${ }^{40}$ | $\mathrm{NO}_{2}^{2}$ |  | $\left\{\begin{array}{l} \infty \\ 0 \end{array}\right.$ | $\begin{aligned} & \text { nd } \\ & \text { nf } \end{aligned}$ | $\begin{array}{ll} \text { do } \\ \text { on } \end{array}$ | ${ }^{\circ}$ | ${ }^{+}$ | $\begin{aligned} & 4 \\ & N \end{aligned}$ |  |  | ${ }^{2}$ |
|  | of | 4 |  |  |  |  | $10$ |  | $\sqrt{0} 0$ | $\sqrt[n]{4}$ | ${ }_{n}^{\infty}$ | $0$ | $0$ | $\begin{array}{ll} \text { on } \\ \text { ion } \\ 0 \end{array}$ | $\cdots$ |  |  | $\underset{T}{T H}$ |  | N |

## APPENDIX VI

Lithogeochemical Sample Descriptions
Sample D.O.H. Depth (feet) Grid Coordinates
No. From To Northing Easting

cp.








EAMPLE DESCRIPTIONS






名名品品品口品品㡙品品品








 | $\oplus$ |
| :---: |
| $\substack{0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0}$ | ※

品吴
E
0
0 0
0
品
of
O
0
 $\stackrel{\text { an }}{0}$
品品





APPENDIX VII<br>Geophysical Instrument Specifications

## INSTRUMENT SPECIFICATIONS

## Proton Hagnetometer

## Instrument

| Type: | Proton Magnetometer |
| :--- | :--- |
| Make: | Barringer GM - 122 |

Specifications

| Measurement: | Total magnetic field |
| :--- | :--- |
| Hange: | 20,000 to 99,999 in 12 ranges |
| Acouracy: | Plus or minus 1 gamma |
| Sensitivity: | 1 gamma |
| Gradient Tolerance: | 600 gammas per foot |
| Reading Cycle: | 3 seconds or 6 seconds |

## Survey Procedures

| Method: | Readings taken every 25 metres along grid lines. |
| :---: | :---: |
| Corrections: | Daily diurnal variations corrected by correlating fiald data with base station readings. |
| Station Relationship: | Each station read for intensity of vertical magnetic field. |


20，000 to 99，999 in 12 ranges
 range $\gamma$ $1 \gamma$
$600 \mathrm{\gamma} / \mathrm{ft}$ ．
12 ＂D＂cells $<50$ Joules（Wsec）per reading
$0.8 \mathrm{~A} @ 13.5 \mathrm{~V}$ for 1.5 sec．（ 3 second
cycle）
0.8 A e 13.5 V for 3 sec ．（ 6 second
cycle）
$2,000-10,000$ depending on type
of batteries
1 every 3 seconds 1 every 6 seconds Pushbutton swltch
Range Selection switch－Slide switch for 3 and 6 sec ．located on P／C Board 5 digit Incandescent fllament
readout
LED polnt
Lock Indicator－last three digits
of the display blanked off when
phaselock not achleved
Segment Function Indicator－all
segments light up to permit visual
inspection of the display function
Readings：
Controls：
Output：
Indicators：

### 1.1 Introduction

The MBS-2 is primarily a recording proton precession total field Magnetic Base Station for observatory or exploration, with further applications in mobile, sea or airborne surveys. Besides the internal strip-chart recorder the instrument is equipped with analog as well as 5 digit digital outputs. For mobile applications an external potentiometric recorder is recommended. Analog ranges are switch selectable for $10 r, 100$, or 1,000 full scale. The station has a world-wide range and repetition rates between 2 seconds and 10 minutes can be selected, with a time marker set at 10 minutes. Provisions are made for external trigger input, recording inhibit signal and 1 second clock outputs.

The internal batteries provide power for about one week of operation, if moderate repetition rates are used. External power can be supplied for observatory or other extended operation. The MP-2 Portable Proton Precession Magnetometer forms an integral part of the MBS-2 and can be easily removed to be used with optional accessories, in the field portable mode.

### 1.2 General Information

This manual describes the MBS-2 main frame only. The MP-2 console, which is contained in the MBS-2 as well as. the sensor are described in detail in a separate manual \# 767700 "MP-2 Proton Precession Magnetometer". The recorder is described in its own manual, "Instruction Manual, Model 2750 Strip Chart Recorder".

Recorder paper can be obtained through Scintrex Ltd., or directly from Simpson Electric Co. or their representatives.

Care should be taken to prevent severe mechanical shocks to the instrument to avoid damage to the recorder.

The recorder should always be locked as described in the recorder manual (locking lever down) during shipment and handling. This prevents the chart drive from slipping out and damaging the window during a possible impact.

## Resolution

Total Field Accuracy

Operating Range

Gradient Tolerance

Sensor

Sampling Rate

Clock Accuracy and Stability

Visual Outputs

External Outputs

1 gamma.
$\pm$ I gama over full operating range.

20,000 to 100,000 gammas in 25 overlapping switch selectable steps.

Up to 5,000 gammas/metre.

Shielded, noise-cancelling dual coil.

Intermal Control: Switch selectable every $2,4,10$, 30 seconds or $1,2,10$ minutes.
External Control: Manual command or by external clock at any rate longer than 2 seconds. For external trigger, a positive transition from 0 to +4 V or greater initiates one reading.
$\pm 10 \mathrm{ppm}$ over full temperature range.

5 digit Light Emitting Diode numerical display lasting 0.1 seconds in automatic recycle mode and 1.7 seconds in manual mode.

Internal strip chart recorder with 65 mm . chart width and 100 or $600 \mathrm{~mm} / \mathrm{h}$ chart speed. Inkless recording. Switch selectable at 10 , 100 or 1,000 gammas full scale.

5 digit, 1-2-4-8 BCD, DTL, TTL compatible (2 loads) with $0.5 \mathrm{msec} ., 5 \mathrm{~V}$ pulse for synchronization of MBS-2 and external recorder.

Analogue recorder output of 1 V at 1 mA max. Switch selectable for 10,100 or 1,000 gammas full scale.

Time Marker

Sensor Cable

Power Requirement

Battery Test

Operating Temperature Range

Dimensions

Weights

A 1.5 second pulse every 10 minutes generates a time mark on the internal or on external analogue recorders.

For an external analogue recorder, a switch to ground is provided .(NPN transistor, 40 V max., 250 mA max.). No side pen is required for continuously writing recorders as the pen returns to zero at every event mark.

50 m length is standard.

The internal batteries of the MP-2 (8 "D" cells) are used to power all functions of the MBS-2. This power source lasts approximately 80 hours at $25^{\circ} \mathrm{C}$ and a once per minute sampling interval.

An external 10 to 32 V DC supply may alternatively be used.

Current drain is approximately 0.9A during polarize time and 35 mA during stand-by, depending upon supply voltage.

Digital readout of normalized internal battery voltage activated by touching switch.

Console: 0 to $50^{\circ} \mathrm{C}$
Sensor : -35 to $50^{\circ} \mathrm{C}$.

Console: 140 mm . x 310 mm . x 390 mm .
Sensor: 80 mm . diameter x 150 mm . length.
Tripod : 130 mm . extended length.

Console: 7.7 kg .
Sensor with Cable : 5.5 kg .
Tripod: 1.5 kg .

Shipping Weight

Optional Accessories

Approximately 18 kg .

Sensor monopod, harness, sensor backpack and 2 m . sensor cable allow field portable survey use of MP-2 magnetometer.









