ARIS SUMMARY SHEET

District Geologist, Kamloops — Off Confidential: 89.06.17

ASSESSMENT REPORT 17753 — MINING DIVISION: Golden

PROPERTY: Mark
LOCATION: LAT 51 47 00 LONG 116 58 00
UTM 11 5736722 502299
NTS 082N15W
CLAIM(S): Mark I-II,Sheila I,Bill I
OPERATOR(S): Dia Met Min.
AUTHOR(S): Fipke, C.E.
REPORT YEAR: 1988, 32 Pages
COMMODITIES
SEARCHED FOR: Diamond
GEOLOGICAL
SUMMARY: At least 8 diatremes have been identified intruding north-northeast folded Paleozoic marine sediments.

A single micro diamond and numerous diamond indicator minerals have been identified in diatreme rock and stream sediment samples from the claims.

WORK
DONE: Geological,Geochemical
GEOL 250.0 ha
PETR 31 sample(s)
SAMP 1 sample(s)
RELATED
REPORTS: 13596,15151
MINFILE: 082N 089

FILMED

LOG NO. 0927 RD.

ACTION:

FILE NO:

REPORT ON THE

MARK PROPERTY

PANGMAN PEAK 82N/15W

GOLDEN MINING DIVISION

LAT 51 DEGREES 47 MINUTES NORTH

LONG 116 DEGREES 58 MINUTES WEST

FOR

DIA MET MINERALS LTD.

KELOWNA, B.C.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

17,753

BY

C.E. FIPKE

C.F. MINERAL RESEARCH LTD.

KELOWNA, B.C.

SEPTEMBER, 1988

ASSESSMENT REPORT

MARK CLAIMS GROUP
GOLDEN M.D.

by C.E. Fipke

INTRODUCTION

The Mark Group consists of four contiguous claims totalling 26 units. The claims are presently 100% owned by Dia Met Minerals Ltd. of Kelowna, B.C. C.E. Fipke was contracted as operator to complete two years of assessment work on the claims. As a consequence, Dia Met Minerals Ltd. funded $8,000.00 (plus $2,400.00 removed from Dia Met's P.A.C. account for work completed within the June 20th, 1987 to June 20th, 1988 assessment period).

The enclosed findings funded by Dia Met Minerals Ltd. are being released to and being completed in conjunction with a diatreme research project being completed by C.F. Mineral Research Ltd.

Previous work by Falconbridge Metallurgical Lab, prior to 1983, resulted in the detection of a single micro diamond, 13 chromite and a single picroilmenite of kimberlitic composition.

The work comprising this assessment report includes the following: geologic mapping and report writing by a world leading kimberlite authority, Dr. M.E. McCallum; polished thin section petrographic analysis by Dr. Sid Williams; heavy mineral concentration of bulk diatreme rock samples for macro and micro diamond and diamond indicator minerals by C.F. Mineral Research Ltd. In addition, scanning electron microscope microchemical analysis of potential diamond indicators and fusion acid product residues was completed by C.F. Mineral Research Ltd.

LOCATION, TOPOGRAPHY, ACCESS

The Mark Claim, the principle claim of the group, is located at Latitude 51 degrees 47 minutes North, Longitude 116 degrees 58 minutes West, NTS 82N/15W; approximately 55 kilometers north of Golden in the Golden Mining District. This claim is located on the ridge leading northerly from Pangman Peak forming the B.C.-Alberta border and is bounded by Banff National Park at the border. See Figures 1 and 2. The claim group extends for 3 kilometers north-south and 2 kilometres east-west; extending westerly to the Valenciennes River.

The topography is extremely rugged and hazardous with some perennial snow cover and exposed precipitous slopes and cliffs. Elevations on the property range from 1,800 metres (6,000 feet) at Valenciennes River to 2,900 metres (9,500 feet) between Pangman Peak and Bush Pass. See Figure 2.

The claims are accessible by helicopter from Golden. There is a logging road within 10 kilometres west of the property.

METHODOLOGY

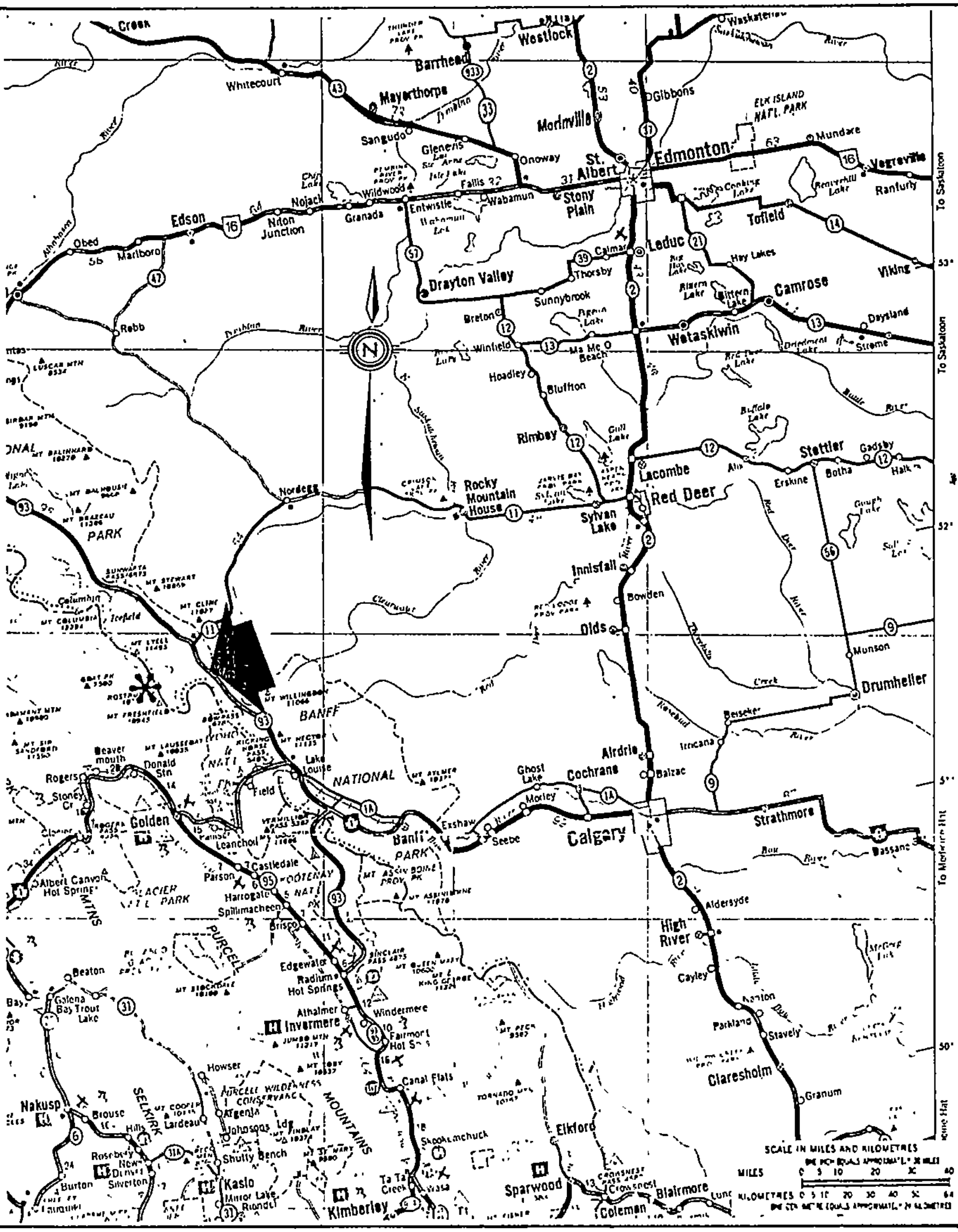
i) Field Mapping

The helicopter-assisted field mapping was completed in early September, 1987 by Dr. M.E. McCallum, assisted by mountaineer Rudy Gersch of Golden, B.C. This was accomplished over a four day period, including travelling, with the use of a two man base camp established on the Mark Claims. Geologist C. Fipke had previously collected a 46 kilogram sample of outcrop from the Big Mark diatreme at location Mark 7 (Appendix A, Figure 1) prior to the assessment period.

ii) Sampling

Thirty rocks selected by Dr. M.E. McCallum and one rock selected by C. Fipke, chosen from diatremes on the Mark Claims, were submitted to petrographer Sid Williams for polish thin sectioning and petrographic descriptions.

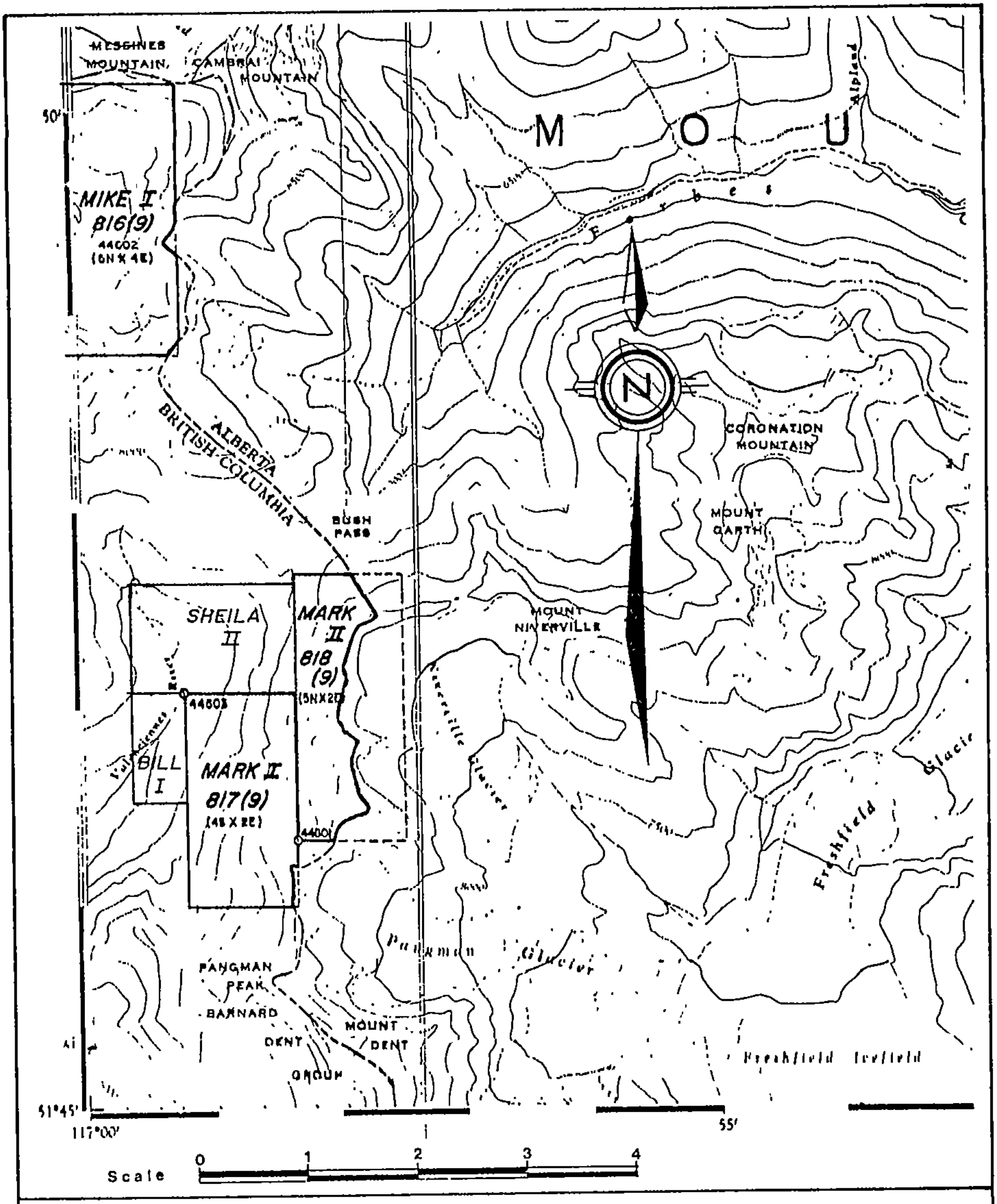
The 42 kilogram rock sample was crushed and pulvarized to -5 mm at the C.F. Mineral Research Ltd. laboratory. The entire sample was then submitted over a period of about 48 hours to a unique wet ball milling process. During the milling, fine particles are continuously removed from the mill when the



DIA MET MINERALS LTD
INDEX MAP
MARK PROPERTY

82N/15W	51° 47′N 116° 58′W
GOWER, THOMPSON & ASSOCIATES Drawn J. F. B.	K.E. NORTHCOTE AND ASSOCIATES LTD April 30 1983

Figure 1



DIA MET MINERALS LTD
CLAIM MAP
MARK PROPERTY

82 N/15W	51° 47'N 116° 58'W
GOWER, THOMPSON & ASSOCIATES Drawn J. F. B.	K. E. NORTHCOTE AND ASSOCIATES LTD April 30 1983

Revised By G.D.T. June 10, 1983

Figure 2

particles reach a 0.5 mm size, thereby preventing overgrinding of fine -0.5 mm particles. After wet ball milling any +0.5 mm and -0.5 mm particles were washed and settled in a shallow container up to 6 minutes. Any unsettled particles were decanted from the settled particles and at another time fluctuated. The settled particles were dried, TBE (S.G. 2.9) and MI (S.G. 3.27) heavy liquid separated, and electromagnetically separated into four diamond indicator mineral concentrates.

Potential diamond indicator minerals were isolated from appropriate electromagnetic separated concentrates of sample Mark 6 with the use of a binocular microscope. About 200 selected potential indicator mineral grains were then mounted in epoxy, polished and carbon coated.

These polished indicator mineral grains were then scanning electron microscope scanned for elements such as Mg-Cr-Fe-Ti.

Eighty-three of the grains scanned were selected, based on their elemental results, for electron microscope analysis. The eighty-three grains selected were then SEM analyzed for Na2O-MgO-Al2O3-SiO2-Nb2O3-Cl-K2O-Ca-TiO2-Cr2O3-MnO-FeO and NiO. A natural standard of pyrope was analyzed on three occasions at the same time as the quantitative analysis of the eighty-three grains.

The resultant analytical data from the eighty-three grains analyzed was transmitted from the scanning electron microscope computer to a Compaq 386 basic language computer whereby the mineralogy of the indicator grains was automatically determined on the basis of chemical composition using a custom program developed by Forough Hobuti of C.F.M.

The resultant electromagnetic concentrated diamond fractions of sample Mark 6 were fused and acidized using a new proprietary procedure (developed over a two year period) which destroys most of the minerals in the diamond concentrates other than diamond. The unacidized and unfused resultant minerals from each of the samples were centrifuged onto scanning electron microscope mounts and binocular microscope inspected by geologist C. Fipke for large (+0.1 mm) diamonds. All of the large grains from the Mark 6 samples were SEM checked for carbon (diamond) by geologist Asger Bentzen.

Owing to a technical problem at the time of writing this report the -0.1 mm micron-sized particles could not be analyzed for micron sized diamond.

RESULTS

The report and maps by Dr. M.E. McCallum are included as Appendix A. The thin section descriptions by Dr. Sid Williams are included as Appendix B. The results of the scanning electron microscope analysis are given as Appendix C.

About 6,973 chromites, 16 probable ilmenites and 4 possible chrome diopsides were found to occur in electromagnetic concentrates from the Mark 7 sample.

No +0.1 mm diamonds were identified in the final fusion concentrates of the Mark 6 sample. Asger Bentzen found that all of the large grains surviving fusion and acidization were corundum or impure silicates. At least one grain of platinum was scanning electron microscope identified in the residual fusion concentrates.

The scanning electron microscope analysis of Appendix C identified 44 chromites, one (G5) ecologitic Mg-almandine garnet, 24 almandine garnets, one sphene, as well as one illite and two chlorite (alteration pseudomorphs). About nine grains could not be computer matched tot he compositions of known minerals and may represent alteration products or mineral intergrowths of inclusions.

CONCLUSIONS

1) The geologic study of Dr. M.E. McCallum, the petrographic work of Sid Williams, the chromites, probably ilmenites, possible Cr diopsides and G5 ecologitic garnet identified are more consistent with the Big Mark diatreme being a possible lamproite rather than kimberlite.

2) The single fusion concentrate result did not succeed in identifying +0.1 mm micro diamond thereby confirming the early findings of Falconbridge Metallurgical Laboratories. However, G5 ecologitic garnets have been identified as inclusions in diamond and in high P-T ecologites, suggesting that diamonds could be identified with additional fusion analysis.

RECOMMENDATIONS

1) Mineralogic work is required on 2.9-3.3 specific gravity concentrates of Mark Claim diatremes which normally concentrate minerals characteristic of lamproite, a significant host rock for diamond.

2) When technological problems are overcome the fused concentrates should be analysed for micro diamond <0.1 mm in size as confirmation of the Falconbridge findings is needed.

STATEMENT OF EXPENDITURES

5 days professional geologist's time @ $300.00 per day	$1,500.00
4 days professional climber's time @ $200.00 per day	$ 800.00
31 polished thin sections and petrographic descriptions @ $43.89 each	$1,360.59
4 hours helicopter time @ $560.00 per hour including fuel	$2,240.00
Travelling and living expenses of field personnel	$ 351.00
4x4 truck rental and gasoline for field period	$ 330.00
48 hours of ball milling on 42 kilogram rock sample @ $22.00 per hour	$1,056.00
Tetrabromoethane (TBE) separations:	
-first 3,000 grams concentrate	$ 14.50
-seven additional 3,000 grams concentrate	$ 84.00
Methylene Iodide (MI) separations:	
-first concentrate	$ 22.00
-seven additional	$ 119.00
6 electromagnetic separations	$ 15.00
Binocular microscope extractions of 200 grains; 5 hours @ $18.20 per hour	$ 91.00
Mounting and polish sectioning and carbon coating	$ 50.00
14 hours scanning electron microscope time @ $120.00 per hour	$1,680.00
Fusion of one diamond concentrate	$ 190.00
Report writing and typing	$ 100.00
TOTAL	$10,003.09
Dia Met funding contribution to above	$8,000.00
Removed from Dia Met PAC Account	$2,400.00
TOTAL DIA MET CONTRIBUTION	$10,400.00

APPENDIX A

Geologic Study of the Mark Diatremes

M. E. McCallum, 1987

The Mark diatreme cluster is situated astride the British Columbia-Alberta border approximately 41 km north-northwest of Golden, B.C. at longitude 116° 57' 50"W and latitude 51° 46' 48"N, NTS 82N/14E. Relief in the area is steep and maximum elevation is approximately 2896 meters. Seven well-defined breccia(?) bodies were observed but only five of these have been authenticated as consisting of diatreme material. Time constraints prohibited on-site evaluation of the Mark 3 and Mark 1X bodies (Fig. 1), which were established as possible diatremes on the basis of binocular scans and helicopter overflights.

The Mark 1, 3, 4, 5, and 6 diatremes all straddle the sharp, rugged northerly trending divide that separates British Columbia and Alberta. The western portions of these bodies are completely exposed in cliff to near cliff faces, whereas eastern extensions, except for the Mark 1 pipe, are entirely covered by the Riverville Glacier in Alberta. Although the Mark 1 diatreme, the largest pipe in the cluster, also extends beneath the Riverville Glacier, a significant portion is well exposed east of the divide for approximately 250 meters in an east trending arete. Fabric within the Mark 1 suggests that this body probably extends a considerable distance to the southeast under the glacier. The probable Mark 1X breccia body (exposed surface area about 40 x 150 meters) to the southeast could be an extension of the main Mark 1 body, and if so, the surface area of the Mark 1 diatreme could have maximum dimensions of as much as 250 x 1200 meters. Even with a more conservative estimate of its extent beneath the glacier, the Mark 1, with dimensions of at least 250 x 550 meters, is one of the largest known diatremes in the Canadian Rockies. The Mark 3(?), 4, 5, and 6 diatremes are all roughly elliptical with average are not uncommon. Fragments range from subangular to well rounded and consist primarily of supracrustal wallrock sediments (dolomite, limestone, mudstone, siltstone, quartzite and argillite). However, rounded blocks of fine- to coarse- grained phlogopite(?) bearing to phlogopite(?) rich lamprophyre (lamproite?) are locally common and in some minor phases may comprise the bulk of the clast material (e.g., sample site MA17H at Mark 1, Fig. 3). A few deeper crustal fragments of granitic rocks were observed, but these typically are intensely altered (carbonatized? and/or hematitized). Groundmass material is similar to that reported for the Jack diatreme breccias, except degree of alteration does not appear to be quite as severe (less sericite?). Most phases are characterized by abundant small (1-2mm), well rounded quartz grains and variable amounts of small (<5mm) wallrock fragments set in a fine-grained matrix of rock flour, clay, serpentine, carbonate, and locally abundant phlogopite(?) and/or opaque minerals. Phlogopite(?) also occurs locally as large (1-3cm) well rounded, partially to intensely altered macrocrysts. Some phases exhibit moderately intense locally pervasive alteration to hematite, and shallow (several mm to cm) surface oxidation to goethite and/or "limonite" is common (dbb).

The Mark 2, 4, and 5 diatremes consist predominantly of pale brown to orange brown weathering, pale gray to olive gray, coarse, tuffisitic breccia. A minor intensely oxidized red phase is present near the south contact of the Mark 4 pipe (sample site MA16D, Fig. 3), and probably reflects greater mobilization of very late oxidizing fluids along that interface. Matrix phlogopite(?) occurs in variable concentrations in these pipes, but is relatively abundant in the Mark 2 breccia.

The Mark 1 pipe contains a variety of phases but most are not of sufficient extent or continuity to warrant subdivision. Only two principal phases were mapped; a dominant dark gray to gray green weathering pale gray to olive gray breccia and a pale brown to dark brown weathering gray breccia. Minor intensely oxidized red to maroon phases occur locally. The breccias range from crudely bedded coarse varieties to well bedded fine- to medium-grained, locally pebbly varieties. The finer grained phases rarely exceed a few meters in thickness, and typically are intimately interbedded with the coarser phases. Locally pelletal phases reflect an earlier "autolithic" fragmentation and/or accretionary process. All phases of the Mike 1 diatreme, as well as the other pipes in the cluster, exhibit a prominent moderate to steeply dipping (50-70° SW) northwest trending cleavage that is roughly conformable to that in the host sedimentary units (Fig. 4). This cleavage conforms with bedding features in the diatreme breccia facies, and appears to have controlled the directional fabric of locally sheared facies (e.g., samples sites MA3, MA9 and MA8 in Mark 1, Fig. 3). A large, southwest dipping tabular slab of gray dolomite in the Mark 1 pipe also appears to be conformable with this prominent cleavage.

Mafic, phlogopite(?) and/or analcite(?) bearing (lamprophyric?) dikes are relatively abundant in the area, and most appear to roughly conform with cleavage. Several intrude breccia of the Mark 1 pipe and many of these dikes have been intensely sheared (e.g., sample sites MA5, MA6, and MA17S, Fig. 3). Quartz + calcite ± ankerite (?) veins (1-10 cm wide) are locally common in the dikes. The veins dip at low angles (< 40° NE) and are generally confined to the dikes. They probably represent gash features which were generated during post-tectonic relaxation processes. Relaxation slippage along axial plane cleavage in host rocks probably promoted partial solution of quartz and carbonates from local siliceous limestone and/or calcareous moudstones and siltstones. Some of the lamprophyric(?) dikes may be genetically related to the tuffisitic diatreme breccias as also may be the lamprophyric(?) clasts within the breccias. Petrographic and chemical data are needed to ascertain such a relationship, but preliminary evaluation of the various phases do not suggest a kimberlitic affinity for either breccia or dike phases.

All of the Mark diatremes appear to be moderately to steeply southwest dipping, elliptical to tabular shaped bodies that conform geometrically with the axial plane cleavage of the host sedimentary units (Fig. 4). This pronounced conformity is similar to that observed at the Jack and Mike diatremes and strongly implies axial plane cleavage control on diatreme emplacement. Presence of a comparable cleavage fabric in the diatreme breccias probably reflects slippage related to very late syntectonic deformation or post tectonic relaxation processes. There is no evidence of folding in the diatremes which precludes pre- or early syntectonic emplacement and infers at least a post Columbian orogeny (<98 Ma) age. Emplacement probably occurred during the latest stages of or shortly after the Laramide orogeny (< 60 Ma), but this can not be definitively ascertained without radiometric age dates.

REFERENCES

Campbell, R.B., 19__, Geologic Map of the S.E. Cordillera: ______________________ ____?

Norford, B.S., 1969, Ordovician and Silurian stratigraphy of the Southern Rocky Mountains: Geological Survey of Canada, Bull. 176, ___p.

EXPLANATION

MESOZOIC CENOZOIC

QUATERNARY

G — Glaciers and Perennial Snowbanks

Qt — Talus

Qm — Moraine

CRETACEOUS(?)-TERTIARY

Lamprophyric(?) Dikes: pale to dark green to greenish black, aphanitic to porphyritic or microporphyritic and locally trachytic, average 0.3-5 m thick; most phlogopite(?) bearing (both fine groundmass and coarser macrocrystal phases), small (< 3mm) rounded grains of analcite(?) locally common; weakly to intensely sheared especially along contacts or dikes within diatreme breccia; locally cut by shallow dipping (< 40° NE) 1-10 cm thick quartz + calcite ± ankerite (?) veins that generally are confined to dike particularly where in host sedimentary units

dbb / db — Diatreme Breccia: tuffisitic(?) breccia ranging from coarse (clasts average 10-30cm but may exceed 1 m) to fine (clasts < 0.5 cm), contains local well bedded, sandy to pebbly horizons or lenses (generally < 2m thick); clasts moderately to well aligned and consist predominantly of nearby supracrustal sediments (dolomite, limestone, mudstone, siltstone, quartzite and argillite), rounded clasts of phlogopite(?) lamprophyre (lamproite?) common and may comprise bulk of clast material locally, deeper crustal granitic fragments less common and typically are intensely altered (carbonitized and/or oxidized); groundmass typically consists of abundant small (1-2 mm), well rounded quartz grains and wall rock fragments set in fine-grained rock flour, clay, serpentine, carbonate and locally abundant phlogopite(?) and or opaque minerals; prominent cleavage parallel or subparallel to axial plane(?) cleavage in host sediments; locally sheared along cleavage surfaces.

dbb; pale brown to dark brown to locally red or maroon weathering gray to olive gray breccia, common in central part of Mark 1 pipe and in outlying pipes

db; dark gray to gray green weathering pale gray to olive gray breccia characteristic of much of the Mark 1 pipe

MESO-CENO | CRET-TERT

Tectonic Breccia: brown weathering, gray, clast supported, dolomite (Ods) breccia; matrix less than 5 percent and consists mainly of rock flour set in angular wallrock clasts; minor lamprophyric(?) tuffisitic breccia matrix material may be present locally; occurs in a tabular to irregular zone at central north edge of Mark 1 pipe; little evidence of significant fragment transport or rounding

PALEOZOIC | ORDOVICIAN

Ods Ordovician (?) Dolomite: pale to dark brown and buff weathering, pale to medium gray, thin to medium bedded (1-2 cm), fine-grained dolomite with abundant buff orange to orange brown, silty to clayey layers (1-20 mm) and locally interbedded pale gray weathering, gray, thin (2-20 mm) to thick (1-2 m) bedded gray limestone; silty-clayey layers commonly accentuate prominent crenulations and minor folds (wavelengths a few mm to several tens of cm) (may correlate with the lower part of the Middle to Lower Ordovician Skokie Formation - Norford, 1969)

Olmo Ordovician (?) Limestone-Mudstone: gray to buff or brown weathering, medium to dark gray, thin to medium bedded (1 cm - 0.5m) commonly argillaceous limestone with abundant buff to orange brown, silty to clayey, platy to irregular layers (1 mm - 1 cm thick); interbedded orange brown weathering, gray brown calcareous mudstone and siltstone locally abundant (may correlate with the Lower Ordovician Outram Formation - Norford, 1969)

Olsp Ordovician (?) Limestone: gray weathering, dark gray, thick bedded (0.3-2.0 m), fine-grained limestone with thin to medium interbeds (1-30 cm) of orange brown weathering, clayey to silty gray limestone (may correlate with the upper massive member of the lower Ordovician Survey Peak Formation)

Geological Contact; precisely to approximately located, dotted where covered, queried where assumed, dashed and queried where inferred

30 — Strike and Dip of Inclined Beds

Strike and Dip of Vertical Beds

10 — Bearing and Plunge of Small Anticline

60 — Strike and Dip of Cleavage (axial plane?)

Cleavage Planes (diagrammatic, in structure section)

ΔMA15 — Sample Sites

Base from Canadian Department of Energy, Mines and Resources, Rostrum Peak, British Columbia - Alberta, 1:50000 82N/14 Sheet, Edition 2,1980

Geology by M.E. McCallum, 1987

REFERENCE

Norford, B.S., 1969, Ordovician and Silurian Stratigraphy of the Southern Rocky Mountains: Geological Survey of Canada, Bull. 176, ___p.

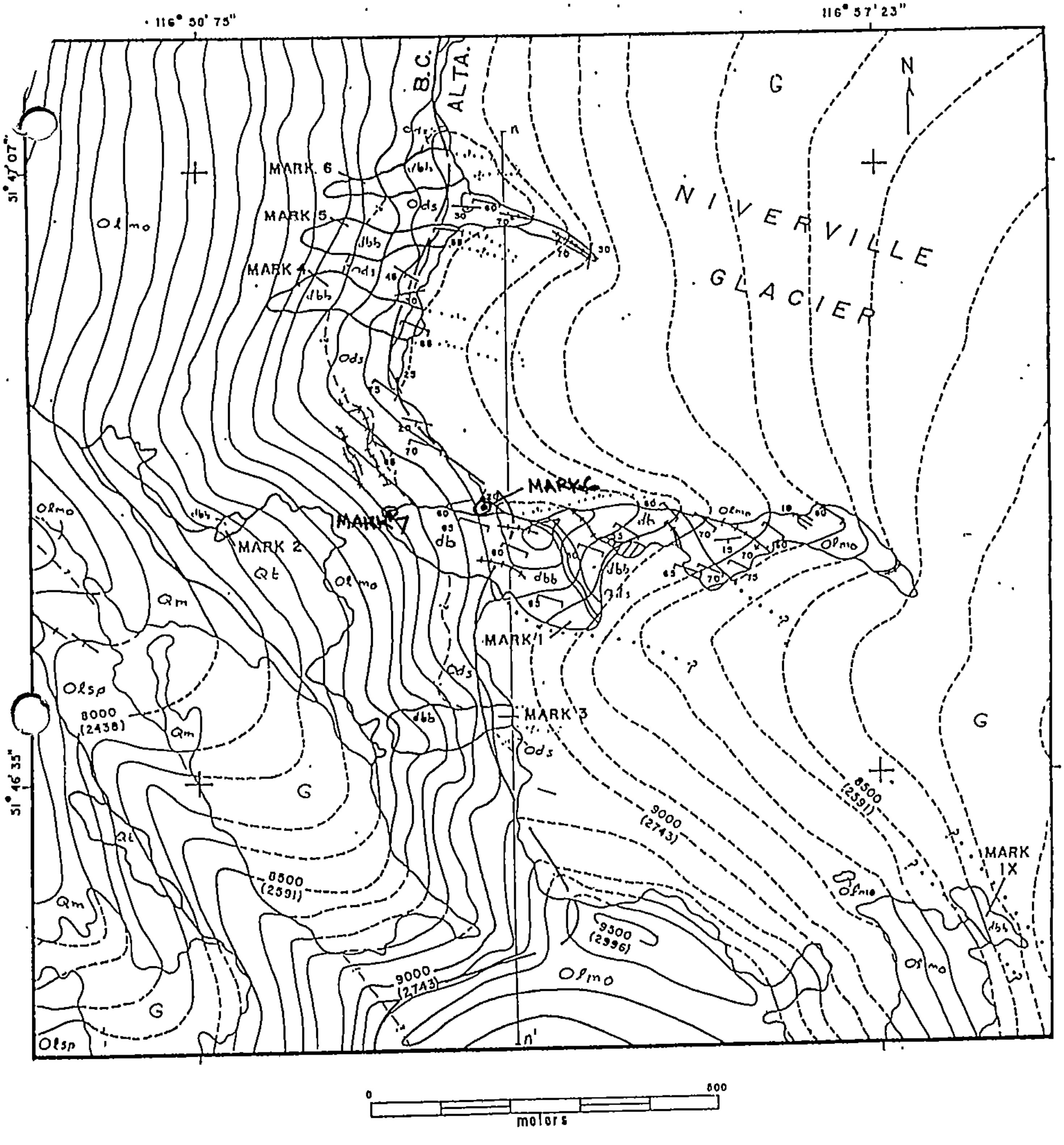


Figure 1

Contour Interval 100 feet (30.48 meters)

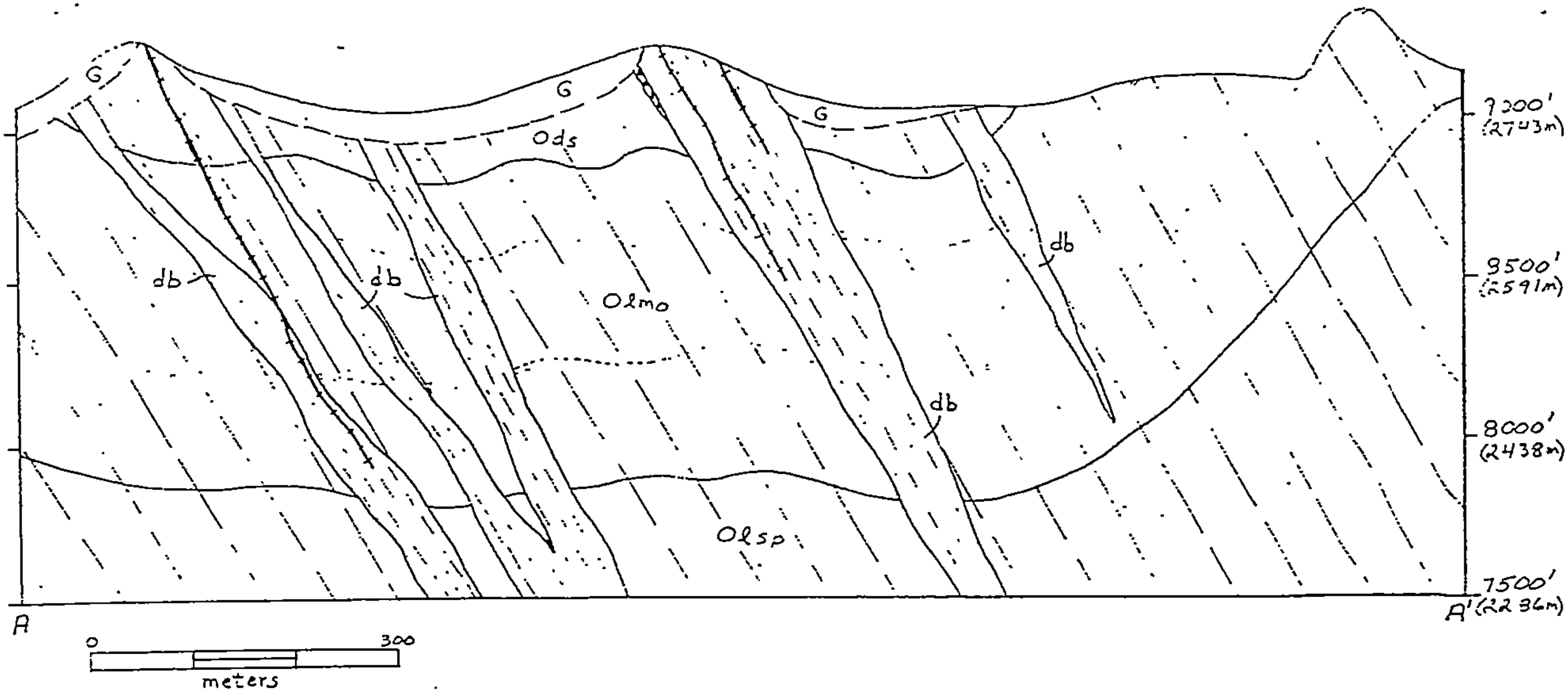
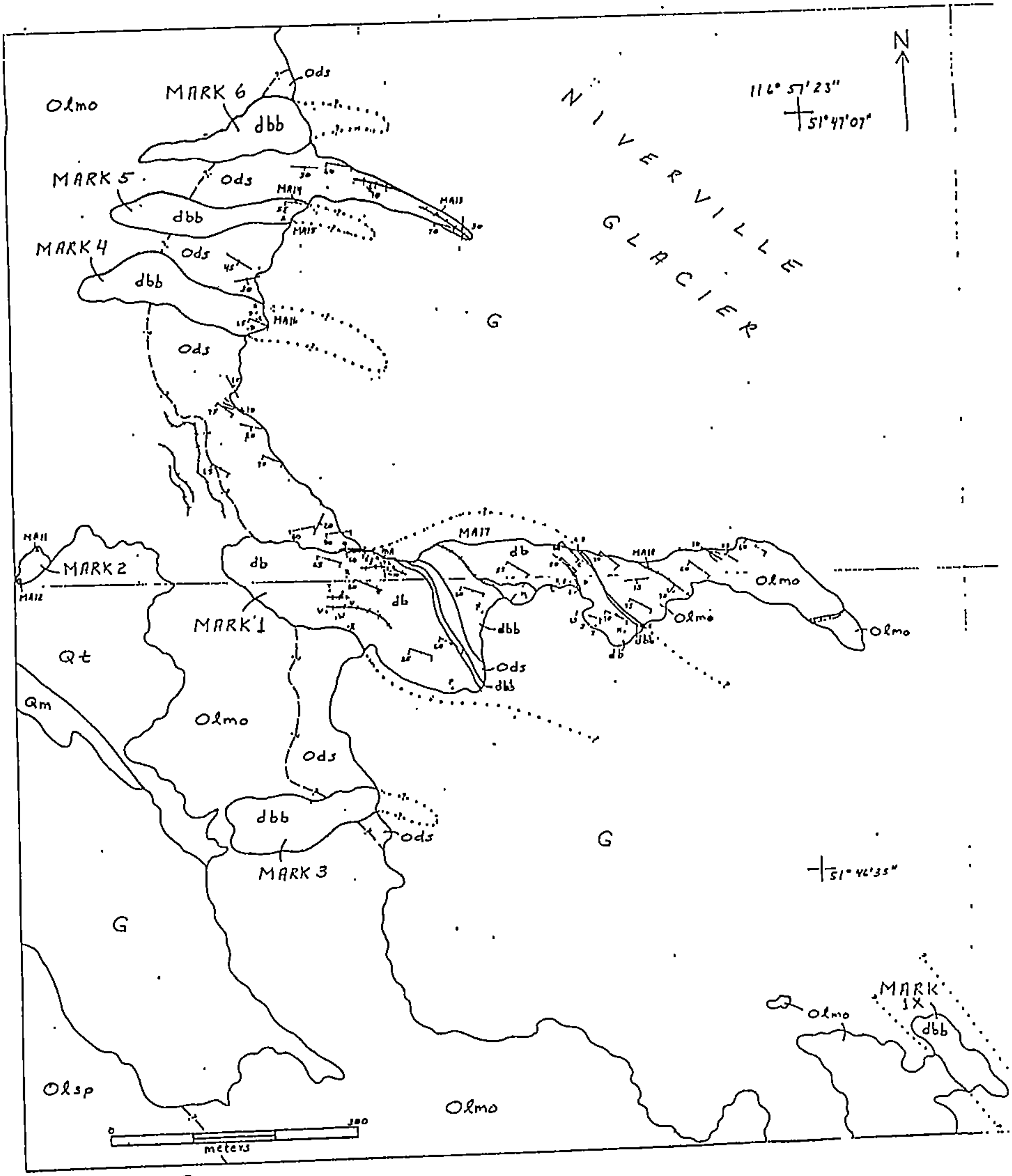


Figure 2. Diagrammatic N-S Structure Section, Mark Diatreme Area



N
NIVERVILLE GLACIER
116° 57' 23"
51° 47' 07"
51° 46' 35"
Olmo
ods
MARK 6
dbb
MARK 5
Ods
MARK 4
G
db
MARK 2
MARK 1
Qt
Qm
dbb
Ods
MARK 3
Olsp
MARK 1X
meters

Figure 3

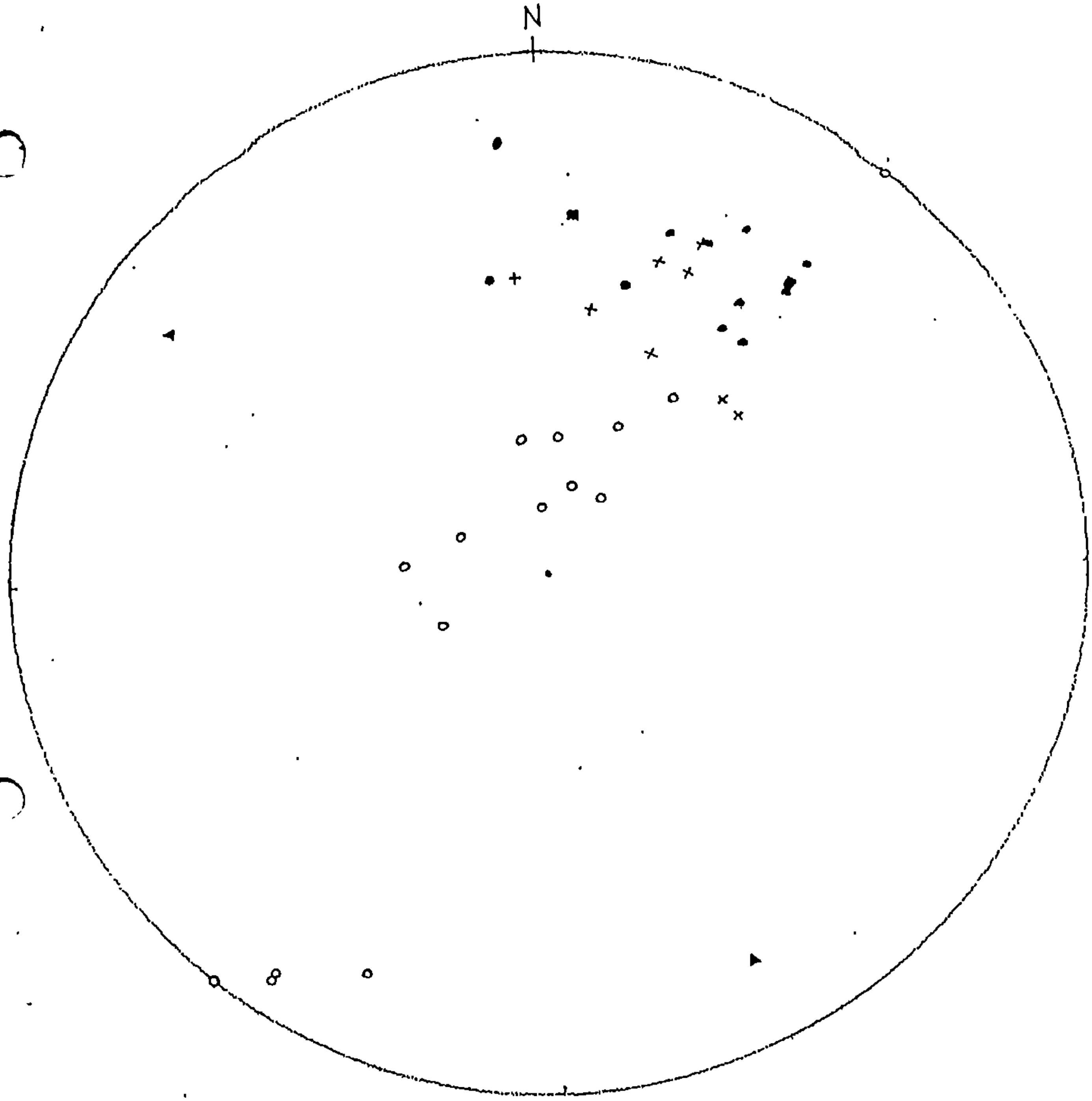


Figure 4. Pole Plot Diagram of Planar Fabric and Dikes, Mark Diatreme Area (Two fold axis lineations included)

- o Poles to sedimentary unit bedding
- • Poles to sedimentary unit cleavage (axial plane ?)
- + Poles to cleavage (and foliation) in diatreme units
- ▪ Poles to lamprophyric(?) dikes
- ▲ Fold axis lineations

APPENDIX B

MA17A

The original rock was a basic effusive porphyry, a normal basalt most likely. It consists chiefly of stubby pyroxene prisms and plagioclase laths in good flow alignment with small ilmenite grains as a common accessory. Phenocrysts of plagioclase and pyroxene dot the fabric with long diagonals parallel to flow. There are also clusters of such crystals that are in fact coarser cognate xenoliths. One quartz xenocryst mantled by fibrous pyroxene was seen.

Epizonal alteration has been strong, but textures remain clear. Plagioclase is entirely altered to coarse shreddy sericite. Most pyroxene is replaced by cloudy, interlocking quartz gains but some is replaced by pennine instead. Larger penninized crystals may earlier have been uralitized. The rock is cut by thin tortuous veinlets of quartz and cross-fiber pennine.

MA17C

The rock is a basalt, more likely effusive than hypabyssal. Its chief constituent is plagioclase. Packets of subparallel laths commingled with isolated, flow-oriented grains indicate autobrecciation on a minute scale during emplacement. Neither plagioclase nor pyroxene phenocrysts were seen; all pyroxene occurs as small prisms on matrix grain boundaries. However, the rock is dotted with subhedral olivine phenocrysts that are well oriented to flow.

Textures remain clear despite strong epizonal alteration. Plagioclase is not entirely altered but is heavily sericitized and dusted with calcite. Fine grained calcite and accessory pennine replace the pyroxene entirely. Sometimes a little cloudy quartz occurs in the pseudomorphs. Olivine is replaced chiefly by iron-stained calcite; some crystal cores are cherty to chalcedonic quartz and a few are replaced by fuchsite and pennine.

MA17D1

The rock is probably a flow breccia, a finely fragmental, generally basaltic fragmental showing no sign of reworking. Most fragments are rounded, with longer dimensions crudely parallel, and they are plagioclase-pyroxene rocks of various grain sizes and degrees of chilling. The matrix seems to be an aggregate of loose crystals but may have been melt in part, for fragments may show reaction boundaries against the matrix. Very rare olivine-biotite rocks are present, and there is a scattering of limestone fragments, some exhibiting fossil remains.

Alteration has been strong, and excepting accessory leucoxene, virtually all minerals are replaced by cloudy, fine grained calcite. Sericite remains in some plagioclase and pennine may persist in mafites. Pennine and interleaved fuchsite fill grain boundaries and slip planes in the matrix.

MA2

The rock is a mixed fragmental, considered a sediment. Most of the larger fragments are themselves sediments, including dolomite, limestone, quartzite, and argillite. They are typically oval or at least subround, and show a preferred orientation of long axes to bedding. Finer lithic debris occupies the matrix, joined by a sprinkling of partly rounded quartz clasts. This lithic debris is mainly a variety of very basic chilled and porphyritic rocks. Loose clasts or phenocrysts identifiable include biotite, hornblende, olivine, and lath-like plagioclase in a few fragments. However, textures of these rocks have been obliterated by epizonal metamorphism and mild deformation.

Fine grained calcite replaces glasses, olivine (and pyroxene), sericite replaced plagioclase, and biotite and hornblende are penninized. The pennine is readily drawn into foliae with a little sericite and the two minerals may form beards on the nether ends of competent clasts. Argillites may also foliate, trailing off at each end as divergent micaceous smears. More competent carbonate rocks remain unchanged.

MA4

The rock is considered a sediment similar to MA2, but here the lithic debris is relatively finer grained and it consists largely of basic igneous material. A wide variety of melanocratic glassy and porphyritic rocks is represented. Identifiable crystals in them include biotite, plagioclase, pyroxene, and olivine. Sediment fragments are in the minority here. Most are fine grained limestone. Dolomite and argillite are rare. Oval quartz clasts also sprinkle the matrix. All constituents have a commonality of orientation of long axes enhanced by weak shearing during epizonal metamorphism.

Textures in basic rocks are virtually obliterated. They are replaced chiefly by very fine grained calcite with pennine representing former biotite, and sericite in larger plagioclase grains. The phyllosilicates tend to foliate only on clast boundaries or within argillites. Some limestones have recrystallized to columnar calcite at their ends, and whiskers of pennine or quartz may appear in these features.

MA5

The rock is a basic porphyry, judged to have been a basaltic effusive. It consists chiefly of laths of plagioclase and stubby pyroxene prisms in fair flow alignment and tiny ilmenite/magnetite grains are a persistent accessory. The small phenocrystals dotting the rock were chiefly pyroxene. Textures have been almost obliterated due to strong epizonal alteration.

The rock is replaced almost entirely by fine grained calcite, and only leucoxene survives in situ as pseudomorphs after ilmenite. Calcite replacing plagioclase is sometimes host to a little sericite, and pennine appears in some former pyroxenes, especially phenocrystals. Quartz is occasionally present with calcite in the larger crystals as well.

MA9

The rock is considered a sediment like MA2 etc. It consists chiefly of basic volcanics that represent a wide variety of textures. Some are clearly fluidal basalts composed of plagioclase and pyroxene; others have phenocrystals of biotite, or olivine, and even orthoclase is a few cases, and they are of uncertain affinity. Sediment fragments are limestones, some silty or arkosic. The matrix is sprinkled with quartz clasts that vary considerably in size and angularity. Textures have been blurred by strong epizonal alteration coupled with mild deformation.

Generally calcite replaces finer grained debris, glasses, pyroxene, and olivines. Pennine has replaced biotite chiefly and may begin to foliate. Quartz has formed in a few larger pyroxene grains. Plagioclase may be sericitized but is often present as fresh albite, and orthoclase also tends to remain fresh. Marginal recrystallization of some limestones is visible, and some have extensional fractures healed by calcite veinlets.

MA11

The rock is considered a sedimentary breccia. It consists chiefly of angular chunks of coarsely crystalline dolomite rocks. A few of these show cryptic fossil remains, many are cherty rocks, and there are a few that are of uncertain origin for they contain remnants of olivine or chromite and may be altered dunites or similar. Silty argillite fragments occur sparingly.

Textures of the matrix, especially, have been blurred due to extensive recrystallization. Dolomite has re-formed as coarse cloudy rhombs and clear quartz may fill interstices in places. Some fragments, once argillic dolomites, are replaced entirely by scaly amesite which seems chromian in part. Sericite has replaced some argillites, others remain essentially unchanged.

MA13

The rock is a basic porphyry that may correlate with MA5. It is likely effusive and consists primarily of plagioclase laths and stubby pyroxene prisms in excellent flow alignment. The small phenocrysts dotting the fabric appear to have been pyroxene mostly. Small grains of ilmenite/magnetite are a persistently disseminated accessory. A few quartzite xenoliths are entrained along flow lines.

Epizonal alteration has virtually obliterated the rock, yet textures remain fairly clear. Cloudy, fine grained calcite replaces virtually everything. Wispy sericite joins it in plagioclase sites, and traces of pennine, rare quartz, and clouding of calcite by colloidal Fe/Ti oxides distinguish former pyroxene.

MA14

The rock is considered a sedimentary breccia. The large angular fragments comprising it are almost all in the range dolomite-cherty dolomite, or dolomite-siltstone. Argillic variants and almost pure kerogenic chertstones are rarer. Round quartz grains dot the matrix debris and there are occasional crystal clasts that were probably pyroxene or olivine.

Epizonal recrystallization of the rock has affected clays mostly. They are recrystallized to randomly oriented sericite scales dotted with cloudy dolomite rhombs. The few suspected mafite clasts are now coarse dolomite rimmed with leucoxenized anatase crystals. Purer dolomite rock seems to have recrystallized little if at all.

MA15

The rock is considered a sedimentary breccia. It is similar to MA14 in texture but contains far more recognizable igneous material. These are chiefly plagioclase-rich basaltic rocks, some coarse grained, others with turgid matrix glass. Equally as abundant are angular chunks of dolomite, including cherty, silty, and argillic varieties. Very few loose quartz clasts occur in the matrix.

Epizonal recrystallization has affected sediments little if at all. Basaltic debris, however, is intensely altered. Cloudy dolomite replaces glasses and mafites and is usually colored with leucoxene whose distribution helps detail former textures. Plagioclase is invariably replaced by a scaly sericite paste.

MA16A

The rock is a fragmental unit considered a sedimentary breccia. The majority of fragments in it are dolomite, ranging from fine grained to coarsely crystalline. Some display fossil

MA16A con't.

remains, others are dotted with silt-size quartz. One fragment of dolomitic quartzite was observed. Fragments are somewhat rounded and lie with long axes parallel. In the matrix there are smaller pieces of lithic debris, basic volcanics, and dolomite, and a few rounded quartz clasts. The basic rocks seem to be normal plagioclase-pyroxene lavas where textures are still visible. Most texture has been destroyed by strong alteration coupled with mild deformation.

Basic rocks are completely replaced by sericite, cloudy dolomite, and a little pennine. The pennine and sericite tend to draw out in the matrix as foliae, often with interlayered quartz whiskers. Matrix dolomite is strongly recrystallized, but there is little visible change within large fragments.

MA16C

The rock is a fragmental unit much like MA16A etc. but is here finer grained and carries more basic volcanic material than dolomite. The dolomites are mainly crystalline rocks, some of them cherty. Quartz pebble chertstone and quartzite were also noted. The basic volcanic debris seems to be normal basaltic and andesitic material but represents a wide variety of textures and degrees of chilling. Where still visible, textures indicate plagioclase-pyroxene-glass basalts and plagioclase-hornblende andesites.

Strong alteration coupled with mild deformation has affected the rock. Andesites tend to be replaced by quartz with sericite shreds in plagioclase sites and leucoxene dust outlining former hornblende. Basaltic rocks are replaced by dolomite plus sericite and a little pennine. The latter two minerals tend to be drawn into foliae in the matrix. Dolomite has recrystallized in the matrix but not within larger chunks.

MA16D

The rock is a cherty dolomite of uncertain origin. It hosts vague, deformed domains that were once basic volcanics (plagioclase-pyroxene) in a matrix of nodular chert and dolomite. Generally dolomite is just disseminated in the chert and forms coarser crystalline patches that bind the nodules together. Some coarser cherty domains host perovskite grains; others are fibrous and clearly are pseudomorphs after larger pyroxene crystals. Rare rounded quartz clasts dot the fabric and suggest that the rock is a dolomitized fragmental in which ultrabasic (olivine-pyroxene) rock was the dominant debris.

In addition to the alteration implied above there is evidence of early deformation, for thin crumpled foliae of fuchsite course through the fabric, entraining strings of cracked or broken chromite grains.

MA17F

The rock is a fragmental basalt of uncertain origin, but some reworking seems likely here. The still-recognizable fragments are fluidal to near-diabasic plagioclase-rich rocks. Those rocks which have lost texture were simply more mafic-rich variants. A few loose quartz clasts dot the matrix and there are occasional fragments of quartzite, dolomite, and limestone. The rock has been epizonally altered and deformed.

Plagioclase shows varying stages of change to albite + calcite and is fresher in leucocratic fragments. Mafites are replaced entirely by calcite and pennine, and the pennine is drawn into foliated lenses that were once melanocratic fragments. Dolomite is generally coarsely crystalline but the calcite that so heavily invests the rock matrix is fine grained.

MA17G

The rock is a fragmental unit considered a sedimentary breccia. It is of mixed character, including a variety of chilled to glassy basalts, rounded limestone fragments, and considerable loose crystalline or fine lithic debris of ultrabasic character in the matrix. Strong epizonal alteration and deformation have virtually obliterated primary textures.

Generally only limestone fragments and the few quartz clasts present remain unchanged. Grains of accessory chromite in the matrix are mostly fresh, with a little mariposite developed along cracks or cleavages. The remainder of the material present is replaced by cloudy calcite for the most part. Leucoxene distinguishes certain mafites and glasses, and pennine is present in pyroxene sites. Sericite has replaced the few biotite grains noted. Phyllosilicates and quartz whiskers tend to foliate between calcite patches in the matrix.

MA17H

The rock is a sedimentary breccia carrying only a few limestone and crystalline dolomite fragments plus numerous volcanic porphyry and ultrabasic fragments. The latter rocks include basaltic types composed of pyroxene and plagioclase (or sausserite), more melanocratic olivine-biotite-chromite rocks, and dolomitized versions of peridotites. Fragments lie with long axes parallel and are closely packed with little fine grained matrix debris.

Epizonal alteration has been accompanied by shearing. Generally cloudy calcite replaces all glasses, plagioclase or sausserite, and matrix litter. Only chromite remains fresh and perovskite is leucoxenized *in situ*. Mafites may be replaced by quartz, pennine, or by a greenish mica that seems chromian, or is visibly interleaved with mariposite in places. Micas tend to foliate in the matrix, often with quartz whiskers at the nether ends of competent fragments.

MA17K

The rock is a lithic breccia in which there are several rock types, the most prominent one a normal basalt. The basalts are glassy to crystalline fluidal or hypabyssal varieties. Matrices usually are composed of plagioclase and pyroxene in about equal amount, and large phenocrysts of olivine may appear. Less common are more mafic porphyries, rich in groundmass pyroxene and biotite, with phenocrysts of orthoclase and biotite. However, the presence of coarse plutonic orthoclase-biotite rock as well suggests that the phenocrysts are in fact xenocrysts. Clasts of biotite, orthoclase, quartz, apatite, and sphene dot the matrix, and one small piece of quartzite was observed. Alteration has been moderate.

Plagioclase is partly replaced by calcite, locally by sericite, but is often fresh. Glasses and olivine are replaced by iron oxides and calcite, and calcite usually replaces pyroxenes. Biotite may alter to clinchlore, a mineral that is often foliated in the calcite matrix of the breccia.

MA17L

The rock is a breccia of mixed rock types and of relatively fine grain size. The majority of fragments appear to be vitric or severely chilled basaltic rocks, often hosting olivine phenocrystals. Nearly as common are pyroxene-olivine-mica rocks with perovskite and considerable accessory iron oxides in places; these do not appear to be kimberlitic but seem lamprophyric instead. Rounded quartz clasts are common in the matrix, and a few small carbonate sediment fragments were seen.

Alteration has been strong. Some plagioclase survives as albite in basalts, but generally glasses and all mafites are replaced by clinochlore which foliates freely in the matrix, and an abundance of granular calcite. Columnar calcite and quartz veins have developed in extensional fractures in limestone clasts.

MA17M

The rock is a fragmental basalt, likely a flow breccia. The matrix is a swarm of flow-aligned laths of plagioclase and stubby pyroxene prisms, in places holocrystalline, in others cemented by glass. The latter material cements the crystalline domains. Subhedral olivine phenocrysts dot the fabric. Ilmenite is a prominent accessory.

The rock has been epizonally metamorphosed and mildly deformed. Plagioclase is replaced by sericite and calcite, and pyroxene is altered to fuzzy, cloudy quartz and pennine. Calcite stained with iron oxides has replaced the olivine. Matrix glass is replaced by pennine which has foliated around crystalline domains, entraining altered phenocrysts and leucoxenized ilmenite with it.

MA17N

The nature of the protolith is uncertain owing to intense alteration coupled with or following an episode of deformation. The rock now consists largely of quartz. Interlocking grains of quartz comprise the matrix and are host to wisps of sericite that show a crude foliation. The distribution of sericite, in small packets, and its absence in certain domains, suggests a xenolith-bearing plagioclase-rich rock originally. Dolomite is present as clusters of closely packed rhombs that could be former phenocrysts or xenoliths. Accessory allanite and anatase occur in mere traces.

MA17P

The rock is a bedded breccia of mixed rock types. Sediments are in the minority, though large chunks of limestone are present. Argillites are uncommon. Most debris is a variety of basic volcanics, including normal basalt porphyries with phenocrysts of plagioclase or of olivine in fluidal to glassy matrices. Perovskite-bearing more melanocratic rocks are present only as more finely comminuted material. Rounded quartz clasts dot the matrix debris.

Epizonal alteration was coupled with mild deformation. Generally sediments are not changed, but basic volcanics are replaced by fine grained calcite. Calcite also replaces almost all matrix debris. Clinochlore derived from mafites or basic glasses tends to foliate in the matrix and may be interlayered with quartz in beards on competent fragments.

MA17R3

The rock is a breccia of mixed rock types. These include normal basalts, of varied degrees of crystallinity, and numerous fragments composed chiefly of dolomite. These dolomite rocks seem to have formed by replacement elsewhere, prior to incorporation in the breccia. One fragment, for example, is coarse dolomite hosting strings of grossularite beads. Another is a quartz-sericite-dolomite rock much like MA17N. Other dolomite rocks have feathery chert in the interstices and sericite strings entrain mariposite; these were surely peridotites originally.

The degree of alteration subsequent to breccia formation is uncertain. The matrix is cloudy, fine grained dolomite with fibrous chert and sericite oriented in the interstices due to mild deformation.

MA17S

The rock is a melabasalt, either effusive or shallow hypabyssal. Its matrix consists of small plagioclase laths and pyroxene prisms of uniform size in very good flow alignment.

MA17S con't.

Pyroxene also occurs as large, nearly euhedral phenocrysts, and evidently there were two species of these. Texture remain clear despite intense epizonal alteration.

Plagioclase laths in the matrix are replaced by a fine scaly paste of sericite. The pyroxene there is altered to cloudy fine grained dolomite. Accessory perovskite or ilmenite is replaced by leucoxene. The pyroxene phenocrysts are altered differently. Those that match the mafite crystals (probably clinopyroxene) are altered to cloudy, fuzzy quartz and dolomite. The other set of crystals has been replaced by clinochlore and dolomite. Thin sharply walled veinlets of calcite and quartz cut the rock.

MA17T1

The rock is a bedded or sedimentary breccia of mixed lithologies. The majority of fragments, and especially the larger ones are dolomite, cherty dolomite, dolomitic siltstone, etc. Argillite and fossiliferous limestone occur sparingly. Igneous material is in the minority and fragments generally small, or represented by single crystal clasts in the matrix. The types are generally basaltic, i.e. plagioclase-pyroxene rocks, and of various textures. A few clasts of olivine were seen in matrix debris together with rounded quartz clasts.

Alteration has affected igneous material almost exclusively, for sediments seem little changed. Feeble shearing has also affected the fabric. Generally basic glasses and mafites are replaced by fine grained dolomite. Sericite has replaced plagioclase and it tends to foliate in the matrix. Beards of sericite and feathery quartz may form between competent fragments.

MA17T2

The rock is a bedded one, presumed sediment, of fine grain size and it consists chiefly of loose crystal clasts. Round quartz clasts comprise over 10% of the detritus. Most of the remainder is pyroxene and plagioclase plus small bits of rock of that composition. Olivine was not observed. There are a few small fragments of dolomite dispersed in the rock.

Epizonal metamorphism/alteration was accompanied by moderate shearing. Dolomite replaces all mafites and glass debris and fills interstitial spaces throughout the matrix. Mafite crystals are readily recognized by the presence of leucoxene residue in the dolomite. Plagioclase is replaced by sericite, but pseudomorphs have usually lost their identity, for the sericite foliates readily in the matrix and may form beards with feathery quartz on the nether ends of competent grains.

MA17V

The rock is a sedimentary breccia composed primarily of large slabs of dolomitic chertstone whose long axes are well aligned in parallel. Less common are fine grained and crystalline dolomites and argillic chertstones. Volcanic debris, mainly plagioclase-pyroxene effusives and porphyries, occurs mainly as fine matrix litter but a few large chunks are present. Round quartz clasts of various sizes dot the matrix, and there are small grains of tourmaline, zircon, etc. as well.

The rock has been epizonally metamorphosed and sheared. Cherts are little affected though recrystallization of dolomite within them may have occurred. Shearing has been accommodated by volcanic fragments which are drawn out as slender lenses, of sericite and cloudy dolomite.

MA17X

The rock is a sedimentary breccia in which virtually all lithic material is sedimentary. The fragments include dolomite, chertstone, argillite, and siltstone, and all intermediate variants thereof. There are round quartz sprinkled in the matrix together with finer lithic debris. Pyroxene clasts are readily visible and comprise a moderate proportion of matrix debris, and certain coarsely crystalline dolomite fragments may well have been pyroxenites originally.

Alteration has been accompanied by mild shearing. Sericite derived from argillite debris is foliated throughout the matrix, entraining dolomite and quartz rubble. Dolomite and chertstone fragments are unchanged. Pyroxene and suspected pyroxenite are replaced by coarsely crystalline dolomite and accessory leucoxene.

T7

The rock is a sheared breccia, perhaps a lithic tuff originally. The largest and most numerous fragments in it are dolomite, cherty dolomite, and fine grained limestone. Smaller fragments of these rocks in the matrix are joined by chilled basic rocks, generally melabasaltic in character with phenocrysts of plagioclase and olivine. Loose quartz clasts dot the matrix and account for just a few percent by volume.

The rock was sheared and altered simultaneously. Carbonate rocks have recrystallized little if at all and are undeformed whereas basic rocks altered to sericite and fine grained carbonate (calcite or dolomite) and are deformed into lenses. Beards of fibrous quartz and pennine have developed on the nether ends of carbonate clasts.

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APPENDIX C

" RESEARCH I DATA FILE "
(Mineral Analysis)

C	ID	SAMPLE	GRAIN	MIN	SIO2	TIO2	AL2O3	CR2O3	FEO	MNO	MGO	CAO	NA2O	K2O	NIO	Nb2O5
1915	MR6	P3C7	4	CR	0.87	0.89	16.48	49.21	15.46	0.00	16.31	0.18	0.31	0.00	0.12	0.16
1916	MR6	P3C7	5	CR	0.46	1.03	19.45	45.99	16.92	0.00	15.85	0.09	0.00	0.01	0.16	0.02
1917	MR6	P3C7	6	CR	0.43	1.11	17.87	45.96	18.27	0.00	15.72	0.15	0.27	0.02	0.11	0.03
1918	MR6	P3C7	7	CR	0.46	0.81	17.17	49.34	15.28	0.00	16.49	0.15	0.16	0.00	0.03	0.10
1919	MR6	P3C7	8	CR	0.51	0.87	14.86	51.70	15.00	0.00	16.41	0.18	0.17	0.00	0.15	0.12
1920	MR6	P3C7	9	CR	0.73	0.69	18.11	47.80	14.71	0.00	17.02	0.19	0.14	0.00	0.17	0.21
1921	MR6	P3C7	10	CR	0.41	0.77	16.03	50.91	14.62	0.03	16.62	0.29	0.13	0.07	0.03	0.08
1922	MR6	P3C7	11	CR	0.64	0.78	17.13	48.43	15.51	0.00	17.01	0.16	0.07	0.03	0.12	0.12
1923	MR6	P3C7	12	CR	0.58	0.84	17.32	48.98	14.90	0.00	16.62	0.17	0.26	0.02	0.12	0.14
1924	MR6	P3C7	13	CR	0.44	0.87	14.94	51.88	14.97	0.04	16.32	0.19	0.10	0.02	0.13	0.08
1925	MR6	P3C7	14	CR	0.41	0.82	16.07	51.10	14.73	0.00	16.32	0.15	0.00	0.00	0.22	0.13
1926	MR6	P3C7	15	CR	0.48	0.62	14.56	52.46	15.97	0.02	15.34	0.12	0.12	0.00	0.08	0.17
1927	MR6	P3C7	16	CR	0.55	0.76	16.66	49.99	14.85	0.00	16.32	0.19	0.22	0.03	0.21	0.17
1928	MR6	P3C7	17	CR	0.50	0.83	17.05	49.13	15.05	0.00	16.51	0.14	0.24	0.03	0.32	0.18
1929	MR6	P3C7	18	CR	0.55	0.92	17.17	48.43	15.37	0.19	16.44	0.17	0.25	0.00	0.20	0.29
1930	MR6	P3C7	19	CR	0.45	0.76	15.82	51.04	15.66	0.00	15.89	0.14	0.05	0.01	0.11	0.03
1931	MR6	P3C7	20	CR	0.58	0.69	16.40	50.39	15.31	0.00	15.95	0.12	0.07	0.04	0.24	0.19
1932	MR6	P3C7	21	CR	0.40	0.78	15.02	51.87	15.53	0.00	16.00	0.14	0.07	0.01	0.16	0.00
1933	MR6	P3C7	22	CR	0.48	0.75	14.64	52.77	15.24	0.00	15.33	0.18	0.14	0.01	0.28	0.13
1934	MR6	P3C7	23	CR	0.63	0.88	16.24	49.94	15.45	0.00	16.06	0.19	0.15	0.07	0.10	0.24
19[illegible]	[illegible]6	P3C7	24	CR	0.57	0.78	16.40	50.33	15.48	0.00	15.69	0.14	0.22	0.07	0.16	0.17
193[illegible]	[illegible]R6	P3C7	25	CR	0.47	0.84	16.06	50.55	15.87	0.00	15.56	0.14	0.17	0.03	0.14	0.16
1937	MR6	P3C7	26	CR	0.59	0.82	14.66	51.72	15.78	0.00	15.90	0.18	0.13	0.00	0.08	0.14
1939	MR6	P3C8	2	CR	0.55	0.71	15.41	49.35	23.25	0.23	10.15	0.15	0.03	0.03	0.10	0.05
1940	MR6	P3C8	3	CR	0.71	0.72	17.69	49.31	14.82	0.00	16.09	0.17	0.23	0.03	0.10	0.11
1943	MR6	P3C8	6	CR	0.56	0.78	17.24	49.51	15.43	0.03	15.74	0.18	0.07	0.04	0.18	0.20
1944	MR6	P3C8	7	CR	0.59	0.68	16.73	49.68	18.42	0.34	13.04	0.16	0.03	0.05	0.14	0.11
1945	MR6	P3C8	8	CR	0.68	0.65	15.80	50.85	16.30	0.34	14.51	0.16	0.24	0.01	0.23	0.20
1946	MR6	P3C8	9	CR	0.63	0.86	17.39	49.35	15.23	0.01	16.00	0.17	0.12	0.01	0.12	0.07
1947	MR6	P3C8	10	CR	0.65	0.68	16.95	50.00	15.43	0.00	15.73	0.14	0.12	0.01	0.17	0.07
1948	MR6	P3C8	11	CR	0.53	0.84	17.89	48.87	15.02	0.00	16.26	0.17	0.20	0.00	0.06	0.13
1949	MR6	P3C8	12	CR	0.71	0.80	15.45	51.32	15.43	0.00	15.53	0.17	0.20	0.00	0.19	0.17
1950	MR6	P3C8	13	CR	0.58	0.82	15.78	48.32	25.18	0.61	8.30	0.14	0.00	0.00	0.21	0.02
1951	MR6	P3C8	14	CR	1.01	1.00	22.18	40.89	16.55	0.12	16.70	0.16	0.67	0.03	0.14	0.43
1952	MR6	P3C8	15	CR	0.61	0.83	17.07	49.63	15.63	0.11	15.57	0.11	0.24	0.01	0.09	0.06
1953	MR6	P3C8	16	CR	0.73	0.79	17.26	49.65	14.90	0.00	15.78	0.19	0.23	0.01	0.27	0.16
1954	MR6	P3C8	17	CR	0.66	0.77	15.71	50.90	15.49	0.00	15.72	0.20	0.11	0.03	0.20	0.17
1955	MR6	P3C8	18	CR	0.64	0.77	17.32	49.91	14.58	0.00	16.17	0.16	0.07	0.05	0.15	0.17
1956	MR6	P3C8	19	CR	0.64	0.82	17.06	49.81	15.23	0.00	15.61	0.16	0.21	0.01	0.20	0.21
1957	MR6	P3C8	20	CR	0.63	0.81	16.66	49.97	15.26	0.12	15.70	0.16	0.32	0.03	0.15	0.16
1958	MR6	P3C8	21	CR	0.58	0.85	16.92	50.68	14.84	0.00	15.52	0.18	0.20	0.04	0.06	0.11
1959	MR6	P3C8	22	CR	0.46	1.63	17.10	41.50	26.38	0.23	12.07	0.13	0.04	0.01	0.15	0.29
1960	MR6	P3C8	23	CR	0.69	0.67	15.43	50.19	21.32	0.25	11.01	0.26	0.01	0.02	0.00	0.13
1961	MR6	P3C8	24	CR	0.66	0.72	16.58	50.62	15.42	0.00	15.21	0.11	0.16	0.02	0.22	0.23
1640	MR6	P9C2	8	G5	38.85	0.00	20.84	0.04	31.99	1.09	5.10	1.94	0.14	0.01	0.00	0.00
1660	MR6	P9C2	28	G	41.75	0.90	22.08	0.12	20.99	0.20	3.36	2.53	0.00	7.75	0.00	0.00

CNT	ID	SAMPLE	GRAIN	MIN	SIO2	TIO2	AL2O3	CR2O3	FEO	MNO	MGO	CAO	NA2O	K2O	NIO	NB2O5
405	MR6	P3C8	5		0.56	0.00	0.22	0.66	13.83	0.61	26.75	56.90	0.08	0.26	0.00	0.00
400	MR6	P2C7	4		33.20	0.24	12.24	0.16	7.84	0.37	13.84	28.02	0.25	3.73	0.11	0.00
401	MR6	P3C7	2		37.68	23.94	1.68	0.00	6.07	0.00	8.82	17.22	0.00	0.32	0.06	4.00
425	MR6	P9C2	22		43.41	0.00	14.53	0.05	38.20	1.41	0.00	2.39	0.00	0.01	0.00	0.00
402	MR6	P3C7	3		46.34	2.65	22.25	3.64	9.98	0.07	5.77	1.21	0.00	7.97	0.11	0.00
426	MR6	P9C2	24		66.83	0.73	6.23	0.24	4.23	0.22	6.51	12.55	0.14	2.18	0.08	0.00
413	MR6	P9C2	10		68.71	0.03	10.27	0.07	16.45	0.61	1.99	1.79	0.06	0.01	0.00	0.00
433	MR6	P9C2	33		77.77	0.75	4.86	0.10	2.30	0.09	3.49	8.73	0.21	1.68	0.00	0.00
404	MR6	P3C8	4		80.70	0.38	11.00	0.33	1.00	0.05	1.74	0.16	0.55	3.88	0.02	0.14
419	MR6	P9C2	16	ALM	37.41	0.08	19.97	0.10	31.25	7.95	1.23	1.79	0.15	0.01	0.04	0.01
427	MR6	P9C2	25	ALM	37.69	0.00	20.41	0.04	35.27	1.76	3.32	1.15	0.11	0.02	0.02	0.16
423	MR6	P9C2	20	ALM	37.85	0.00	20.40	0.06	31.97	6.28	2.05	1.27	0.01	0.05	0.00	0.07
410	MR6	P9C2	5	ALM	38.04	0.00	20.59	0.09	35.42	1.47	3.01	1.09	0.16	0.05	0.00	0.07
429	MR6	P9C2	27	ALM	38.07	0.10	20.47	0.04	26.25	6.23	2.62	6.05	0.13	0.03	0.00	0.00
431	MR6	P9C2	30	ALM	38.09	0.03	20.69	0.07	34.54	1.92	3.22	1.21	0.12	0.00	0.00	0.08
428	MR6	P9C2	26	ALM	38.13	0.00	20.78	0.03	32.76	2.31	4.09	1.68	0.18	0.01	0.00	0.02
406	MR6	P9C2	1	ALM	38.16	0.04	20.71	0.13	34.47	2.27	2.62	1.15	0.11	0.00	0.20	0.12
411	MR6	P9C2	6	ALM	38.25	0.07	20.50	0.02	33.87	1.86	3.55	0.98	0.34	0.30	0.01	0.08
407	MR6	P9C2	2	ALM	38.25	0.05	20.82	0.00	34.35	1.53	3.57	1.14	0.16	0.06	0.00	0.00
408	MR6	P9C2	3	ALM	38.26	0.00	20.77	0.04	34.12	1.69	3.67	1.08	0.12	0.05	0.00	0.18
409	MR6	P9C2	4	ALM	38.27	0.07	20.75	0.06	31.74	1.19	4.50	3.14	0.15	0.08	0.00	0.05
421	MR6	P9C2	18	ALM	38.28	0.02	20.61	0.07	34.57	1.15	3.92	1.08	0.21	0.00	0.00	0.04
430	MR6	P9C2	29	ALM	38.40	0.00	20.80	0.01	28.56	4.27	3.81	3.99	0.13	0.01	0.00	0.00
412	MR6	P9C2	7	ALM	38.48	0.01	20.89	0.09	30.75	2.35	4.44	2.47	0.29	0.00	0.00	0.24
424	MR6	P9C2	21	ALM	38.61	0.04	20.58	0.10	29.59	1.11	3.78	5.91	0.07	0.02	0.00	0.16
414	MR6	P9C2	11	ALM	38.66	0.03	20.68	0.06	32.56	2.59	3.95	1.11	0.21	0.07	0.01	0.00
432	MR6	P9C2	31	ALM	38.71	0.02	21.14	0.09	32.91	1.18	4.51	1.11	0.15	0.01	0.04	0.07
415	MR6	P9C2	12	ALM	38.76	0.15	20.98	0.05	20.67	9.08	4.33	5.74	0.21	0.00	0.00	0.02
416	MR6	P9C2	13	ALM	38.77	0.00	20.83	0.03	33.69	1.24	4.28	0.94	0.18	0.00	0.00	0.04
417	MR6	P9C2	14	ALM	38.96	0.06	20.75	0.09	34.23	0.15	4.14	1.40	0.12	0.05	0.00	0.02
422	MR6	P9C2	19	ALM	39.23	0.06	20.68	0.08	32.17	1.75	3.82	1.86	0.20	0.11	0.00	0.00
420	MR6	P9C2	17	ALM	39.44	0.02	20.76	0.07	31.70	0.68	4.18	2.87	0.16	0.07	0.00	0.00
434	MR6	P9C2	36	CHL	16.82	0.26	5.62	0.00	61.95	0.57	6.11	5.14	0.00	0.60	0.14	0.96
418	MR6	P9C2	15	CHL	22.19	0.13	4.24	0.40	65.24	0.57	3.13	1.15	0.00	0.78	0.36	0.52
403	MR6	P3C8	1	ILL	53.48	1.03	24.74	2.62	3.46	0.09	3.59	0.00	0.34	10.49	0.16	0.00
435	MR6	P9C2	40	SH	32.15	36.51	1.71	0.05	1.37	0.09	0.00	27.87	0.00	0.11	0.04	0.09

Statement Of Qualifications

Charles E. Fipke - Kelowna, B.C.

Owner/Operator of C.F. Mineral Research Ltd.
B.Sc. Honours Geology, University of British Columbia
Member of the Association of Exploration Geochemists of North America, Member of the Canadian Institute of Mining & Metalurgy.

Since 1970 Mr. Fipke has worldwide experience as a geologist, specialized in heavy mineral geochemistry i.e., New Guinea, Australia, New Zealand, South Africa, Brazil, Canada and U.S.A.

Founded C.F. Mineral Research Ltd.; co-ordinated and assisted in the design of a heavy mineral and conodont laboratory unique to the western world; is experienced in the diamond indicator mineral industry; has published papers and articles which are widely used in the industry.