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Project: Faro Northwest
40 samples of intrusive rocks, pelitic and calc-silicate schists

Summary:

1.0 Igneous and Metamorphosed Igneous Rocks

1.1 Quartz Diorite to Quartz Monzonite, Andesite

A deformation foliation was seen only in sample 88-90. However, textures of 88-169 also suggest metamorphism. Modes of major and minor minerals are shown below.

Sample	Plag	K-fs	Qtz	Musc	Bio	Chl	Hbld
88-90	28	38	27	2	6	-	-
88-169	45*	16	27*	-	8*	0.5	m
88-413	65*	4	17	-	7*	-	5*
88-414	30*	34	25*	3	3*	s	-
Faro NW	62	3	23	-	11	2	-
Faro Div	78*	-	-	-	14	s	9*

* includes some phenocrysts
s secondary after biotite

88-90 regionally metamorphosed quartz monzonite gneiss; megacrysts of K-feldspar of metamorphic origin; micas concentrated in seams parallel to gneissic foliation

88-169 metamorphosed, porphyritic granodiorite; metamorphic textures shown by biotite

88-413 porphyritic potassic quartz diorite; dominant phenocrysts of hornblende; possibly metamorphosed

88-414 leucocratic quartz monzonite, slightly porphyritic; unmetamorphosed

Faro NW slightly porphyritic quartz diorite dike; unmetamorphosed

Faro DIV porphyritic andesite dike, unmetamorphosed

In samples 88-169, 88-413, 88-414, Faro Div, and Faro NW, plagioclase shows strongly zoned crystals. This is the major similarity between these five samples, and on this basis, all but 88-169, which was metamorphosed, could be from the same igneous suite. Correlation of Faro DIV is weak, and it may be from a separate, more mafic source.

1.2 Ultramafic Rocks

No metamorphic foliation was recognized. Foliation in 88-477 probably is primary igneous layering.

88-470 relic olivine, altered clinopyroxene, and opaque are set in a groundmass of tremolite-chlorite-opaque; vein of chlorite/serpentine and tremolite

88-477 foliated feldspathic dunite; altered to tremolite; veins of serpentine/chlorite-magnetite

2.0 Pelitic Schists

Pelitic schists show a wide range in composition, and are dominated by quartz, micas, and plagioclase. Typical metamorphic minerals include abundant andalusite, much less cordierite, and minor staurolite and sillimanite. Where these minerals are present, the metamorphic grade can be established to a certain degree. In several samples, sericite is secondary after one or both of plagioclase and andalusite. Mineral X is an unknown metamorphic mineral altered completely to cryptocrystalline to extremely fine grained chlorite/sericite.

Most show effects of strong deformation, with original foliation contorted strongly, and phyllosilicate recrystallized moderately in axial planes of folds to define a second, spaced foliation.

Modes of major and minor minerals are shown below. Included in the list are schist lenses interlayered with calc-silicate rocks.

Sample	Plag	Qtz	Musc	Bio	Chl	Trem	K-Fs	And	Ser	Other
88-33	33	18	4	18	3	-	-	18	-	1 (Sta)
88-115	8	37	16	20	-	-	-	13	-	- -
88-137	s	33	43	-	-	-	-	s	16	- -
88-144	2+s	57	16	12	-	-	-	2+s	11	0.5 (Cor)
88-151	8+s	37	2	17	-	-	0.5	18+s	16	2 (X)
88-189	13	37	11	11	s	-	-	0.2	-	5 (Cor)
88-214	s	16	-	3	4	-	-	9+s	67	2 (Sil)
										0.1 (Cor)
88-227	0.5	33	33	13	s	-	-	16	-	-
88-229	3	42	43	11	-	-	0.5	-	-	0.2 (Epi)
88-258	9	33	3	27	-	-	-	18	-	3 (X),
										t (Sil)
88-260-1	57	-	-	16	-	-	5	-	-	-
88-365-1	-	-	-	-	1	98	-	-	-	-
88-383	37	6	5	-	18	3	-	-	-	0.3 (Epi)
88-400	23	16	1	0.7	13	3	2	-	-	13 (Epi)
88-422-2	30?	5	13	-	23	-	30?	-	-	-
88-428	37	16	-	m	27	-	m	-	-	18 (Ct)
88-433	37	23	13	-	4	-	0.2	-	-	-
88-468-3	37	37	3	16	2	0.2	4	-	-	-
88-483	s	33	33	6	2	-	-	13+s	13	-
88-544	55	20	-	20	-	-	-	-	-	5 (Dio)

In Sample 88-137, plagioclase and andalusite are altered completely to sericite. The sample is strongly weathered, with replacement patches and veins of limonite-kaolinite.

Sample 88-214 is similar to many of the other samples, with the following distinct features: It contains moderately abundant sillimanite (the only sample to contain much of this mineral), and plagioclase and andalusite are both replaced completely by sericite.

3.0 Calc-silicate Rocks

Calc-silicate rocks show a moderate variation in composition. Many are dominated by plagioclase and diopside, with lesser quartz and chlorite. Some have interlayers of marble containing calc-silicates and K-feldspar. Many show similar effects of deformation as do the pelitic schists, with a second foliation less strongly developed because of the relative shortage of phyllosilicates.

Sample	Plag	Diop	Qtz	Chl	Bi/Ph	Ct	Tr/Ac	Epi	K-fs	Sph	Gar
88-105	37	16	5	4	2	27	-	1	8	m	-
88-183	42	23	18	8	-	-	2	m	5	0.7	-
88-260-1	57	23	13	-	-	-	3	-	-	0.3	-
88-365-2	M	M	M	m	-	-	m	M	m	-	m
88-422-1	-	M	(see 5.0	Skarn)							
88-422-2	6	77	m	-	-	0.2	-	-	-	0.2	16
88-450	e	-	2	11	-	2	9	73	3	-	-
88-464-1	42	33	8	8	-	3	2	0.5	3	m	-
88-468-1		M	(see 5.0	Skarn)							
88-468-3	42	18	13	-	-	2	2	13	3	0.5	-
88-544	42	18	4	t	-	-	-	-	-	1	-

Samples 88-180 and 88-203 are grossly similar in that they are marbles with abundant, intimately intergrown lenses of silicates. The silicate assemblages are distinctly different; in Sample 88-180 the assemblage of plagioclase-quartz-biotite-tremolite is more typical of the pelitic schists, and in Sample 88-203, the assemblage of diopside-(plagioclase-epidote-K-feldspar-chlorite) is more typical of the calc-silicate.

Samples 88-260-2 and 88-464-2 are grossly similar, in that they are marbles with abundant calc-silicates in irregular lenses. In Sample 88-260-2 the dominant calc-silicate is diopside with lesser tremolite, whereas in Sample 88-464-2, the dominant calc-silicates are garnet and diopside (with lesser phlogopite).

Carbonaceous opaque was recognized in significant abundance in Sample 88-365-1 and Sample 88-433.

Samples 88-365-2 and 88-450 are both strongly contorted calc-silicate rocks. Zone 1 of Sample 88-365-2 is very similar to much of Sample 88-450. Base on this similarity, the two samples could be correlated .

4.0 Marble with Calc-silicates

Samples of marble contain lenses or disseminated grains of a variety of calc-silicates. Some samples consist of interbanded calcite-rich layers and calc-silicate layers; modes given below are for total rocks, where no strong layering is present, and for calcite-rich layers in layered rocks.

Sample	Ct	Diop	Plag	K-fs	Qtz	Epi	Trem	Gar	Chl	Bi/Ph
88-105	M	M	-	M	m	-	-	-	-	-
88-203	42	37	8	5	-	5	-	1	3	0.2
88-260-2	62	11	-	-	-	-	m	23	0.7	4
88-464-2	57	33	0.3	4	0.5	-	5	-	1	0.5
88-468-2	89	5	2	0.5	0.3	-	1	-	-	2

5.0 Skarn

Samples in which calc-silicate is replaced by skarn assemblage. Relic calc-silicate is finely banded granular diopside, whose texture was preserved in part during skarn formation. This suggests that skarn was formed after at least one period of deformation, but possibly not the one which deformed the rocks into shear folds.

Sample	Gar	Dio	Ct	Qtz	Epi	Chl	Spl	(relic Dio)
88-422-1	65	5	1	1	1	0.3	-	27
88-468-1	77	3	5	5	-	-	m	11

Symbols in Tables

M over 10% in sample in which mode was not determined
m 2-10% in sample in which mode was not determined

s plagioclase or andalusite altered to sericite; biotite altered to chlorite

e plagioclase altered to epidote

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Sample 88-33 **Deformed Schist: Plagioclase-Biotite-Andalusite-Quartz-Muscovite-(Staurolite)**

The rock is dominated by plagioclase with less biotite, quartz, and andalusite, with much less muscovite and chlorite/sericite, and minor staurolite (in cores of andalusite porphyroblasts). A moderate compositional banding is defined in hand sample by variation in the biotite:plagioclase+quartz ratio. A second deformation event warped this foliation, and produced a moderate lineation parallel to axes of the kink folds.

plagioclase	30-35	staurolite	1%
biotite	17-20	ilmenite	0.3
andalusite	17-20	apatite	minor
quartz	17-20	tourmaline	trace
muscovite	3- 4	zircon	trace
chlorite/sericite	3- 4		

Plagioclase forms anhedral grains averaging 0.2-0.5 mm in size. Some grains contain minor subrounded to lensy quartz inclusions. Alteration of plagioclase is slight to sericite.

Biotite forms anhedral flakes averaging 0.2-0.8 mm in length, with a few up to 1.2 mm long. Pleochroism is from pale brown to medium/dark red to brownish red. A few grains are altered completely to pseudomorphic chlorite.

Andalusite forms ragged, equant to elongate porphyroblasts averaging 0.7-2 mm in size. Many contain abundant poikilitic inclusions of quartz and/or biotite, and less abundant tabular grains of ilmenite. A few porphyroblasts consist of extremely fine intergrowths of about equal amounts of andalusite and quartz.

Quartz forms anhedral, equant grains averaging 0.05-0.2 mm in size. It is concentrated in a few quartz-rich lenses up to several mm across, and elsewhere forms interstitial patches to plagioclase and andalusite. Quartz-rich lenses contain minor plagioclase and disseminated flakes of muscovite and biotite. One quartz-rich lens or veinlet is dominated by grains averaging 0.5-0.8 mm in size.

Muscovite forms flakes averaging 0.1-0.7 mm in length intergrown with biotite.

Chlorite/sericite(?) forms cryptocrystalline to extremely fine grained aggregates in patches averaging 0.07-0.15 mm in size, generally intergrown with biotite. These may be after Mineral X.

Staurolite forms anhedral grains averaging 0.1-0.5 mm in size in cores of andalusite grains. One ragged core is up to 1.3 mm across. Some grains are very pale yellow and non-pleochroic and others are weakly pleochroic from very pale to light yellow. Optical properties which fit those of staurolite are: R.I. about 1.75, birefringence about 0.010, optic sign: biaxial positive.

Ilmenite forms tabular grains up to 0.6 mm in size, commonly intergrown with andalusite. Opaque of uncertain composition forms anhedral grains averaging 0.05-0.15 mm in size associated with micas and andalusite.

Apatite forms subhedral to euhedral prismatic grains averaging 0.05-0.12 mm in length, with a few up to 0.3 mm long, and a few, anhedral, equant grains up to 0.15 mm across.

Tourmaline forms subhedral prismatic grains up to 0.06 mm long; pleochroism is from light to medium green.

Zircon forms anhedral grains averaging 0.01-0.03 mm in size, with a few up to 0.07 mm long. They are associated with biotite, in which are formed dark pleochroic halos around the zircon grains.

Sample 88-90 **Banded Biotite-Muscovite Quartz Monzonite Gneiss**

The sample contains megacrysts of K-feldspar, concentrated in certain bands, and intergrown with finer grained aggregates of plagioclase and quartz, with much less biotite and muscovite concentrated moderately in seams parallel to foliation.

K-feldspar	35-40%
plagioclase	25-30
quartz	25-30
biotite	5- 7
muscovite	1- 2
hematite	0.2
apatite	minor
zircon	trace

K-feldspar forms anhedral to euhedral megacrysts up to 4 cm in size, some of which are Carlsbad twins. Many contain irregular, very fine grained patches of plagioclase, probably of exsolution origin. Inclusions consist of subhedral to euhedral grains of plagioclase, anhedral grains of quartz, and minor ragged flakes of micas.

Plagioclase forms a few subhedral to euhedral prismatic grains up to 1.7 mm long enclosed in K-feldspar megacrysts. They show weak compositional growth zoning with some oscillatory zones. Alteration is weak along fractures to cryptocrystalline to very fine grained sericite. Outside K-feldspar megacrysts, plagioclase grains are more irregular in outline, and commonly more strongly altered to very fine grained sericite and dusty opaque (hematite?). Grain size ranges from 0.3-3 mm. On borders of K-feldspar grains are numerous patches of myrmekitic plagioclase up to 0.7 mm in size.

Quartz forms patches up to a few mm across of anhedral, slightly to moderately interlocking grains with slightly wavy extinction. In several patches, textures suggest that coarser grains were recrystallized to finer grained aggregates under weak shear deformation.

Biotite forms ragged flakes averaging 0.2-1 mm in length, with a few up to 2 mm long. Pleochroism is from pale brown to medium reddish brown. Much of the biotite is partly altered along cleavage to pseudomorphic, pale green chlorite, with ragged patches of cryptocrystalline Ti-oxide. A few patches are altered to pale to light brownish green biotite/chlorite with properties intermediate between those of biotite and those of chlorite. One patch 1 mm long consists of an aggregate of radiating patches of grains grading from chlorite to biotite/chlorite. In one large patch, biotite flakes are altered completely to strongly to chlorite with abundant patches of Ti-oxide.

Associated with biotite are flakes of muscovite of similar size and texture. A few muscovite flakes are intergrown with quartz.

Micas are concentrated moderately in irregular seams parallel to foliation. A few mica-rich seams consist of very fine to fine grained biotite and muscovite intergrown with plagioclase and quartz.

Hematite forms a few patches up to 0.15 mm in size of single opaque grains or deep red-brown, cryptocrystalline aggregates and a few slender flakes up to 0.05 mm long, mainly associated with biotite.

Apatite forms a few anhedral to euhedral grains up to 0.2 mm in size with biotite.

Zircon forms grains averaging 0.01 mm in size in biotite. Many of these have dark pleochroic halos. A few stubby subhedral grains in plagioclase are up to 0.03 mm long, and one slender prismatic grain in quartz is 0.05 mm long.

Sample 88-105 **Calc-silicate Rock with Interlayers of Calcite-Diopside-K-feldspar-(Quartz) = Impure Marble**

A calc-silicate rock dominated by plagioclase with much less biotite, chlorite and diopside, contains interlayers averaging a few mm wide of impure marble composed of calcite-diopside-K-feldspar-(quartz). A few fold noses are preserved in the rock, suggesting that it was strongly deformed, and that the present compositional banding represents a foliation formed during intense shear deformation.

plagioclase	35-40%
calcite	25-30
diopside	15-17
K-feldspar	7- 8
quartz	4- 5
chlorite	3- 4
biotite	1- 2
epidote	1
Ti-oxide	1
opaque	0.5
sphene	minor
veinlets	
epidote	trace

Plagioclase forms aggregates of slightly interlocking grains averaging 0.05-0.1 mm in size; grains commonly are slightly elongate parallel to foliation. Intergrown with plagioclase are moderately abundant wispy seams of Ti-oxide-opaque(ilmenite?) and minor chlorite parallel to compositional banding. Layers are warped slightly to moderately, with fold axes averaging 0.5-1 mm apart and oriented perpendicular to the compositional banding. This deformation is shown well by the seams of Ti-oxide/opaque in plagioclase/rich layers.

Biotite forms moderately abundant, disseminated, very fine grained flakes oriented parallel to foliation in some plagioclase-rich layers. Pleochroism of biotite is from nearly colorless to light or medium brown. Some biotite is altered to chlorite-(Ti-oxide). In a few layers up to 2 mm wide, chlorite forms unoriented clusters of flakes averaging 0.05-0.1 mm in size, intergrown with very fine grained plagioclase and minor epidote. Chlorite forms several clusters up to 0.5 mm in size of slightly coarser grained flakes.

Diopside forms irregular, in part skeletal grains averaging 0.1-0.5 mm in size intergrown with plagioclase in a few layers. In some of these layers, plagioclase may be altered to extremely fine grained epidote. Elsewhere it forms finer grained, granular aggregates intergrown with plagioclase.

Opaque (pyrite?) forms irregular clusters up to 0.3 mm across of grains averaging 0.05-0.1 mm in size intergrown with chlorite.

Sphene forms subhedral grains averaging 0.02-0.05 mm in size, and a few very fine grained lenses up to 0.05 mm wide and 0.2 mm long.

Impure marble layers are dominated by calcite grains averaging 0.1-0.7 mm in size, with a few up to 1 mm across. Diopside forms abundant, ragged, in part skeletal grains averaging 0.1-0.8 mm in size. K-feldspar forms anhedral grains averaging 0.1-0.5 mm across, with a few up to 1 mm in size and with a few patches of extremely fine grained aggregates. Quartz forms disseminated grains averaging 0.05-0.1 mm in size.

Epidote forms wispy, discontinuous veinlets averaging 0.02-0.03 mm in width.

Sample 88-169 **Metamorphosed Biotite Granodiorite**

Phenocrysts of plagioclase and minor ones of quartz, biotite, and hornblende set in a groundmass of plagioclase, quartz, K-feldspar, and biotite. Biotite shows metamorphic textures.

phenocrysts	
plagioclase	12-15%
quartz	1
biotite	1
hornblende	minor
groundmass	
plagioclase	30-35
quartz	25-30
K-feldspar	15-17
biotite	7- 8
chlorite	0.5
opaque	minor
apatite	trace
zircon	trace

Plagioclase forms a few subhedral to euhedral phenocrysts from 1.5-2 mm in length. Some grains are zoned strongly from cores of **An40** to rims of **An15-20**. Some grains show two distinct stages of growth. Cores of many grains are altered strongly to sericite and/or skeletal to dense patches of extremely fine grained epidote. Finer grained plagioclase averages 0.5-0.8 mm in size, and shows textures and alteration patterns similar to those in coarser grains.

Quartz forms a few phenocrysts up to 1.5 mm in size, with irregular borders against the groundmass.. Most quartz occurs as equant, anhedral grains averaging 0.1-0.3 mm in size, commonly intergrown with K-feldspar.

K-feldspar forms anhedral grains averaging 0.2-0.5 mm in size containing abundant dusty hematite inclusions. It commonly forms in intergrowths with finer grained quartz in patches interstitial to plagioclase.

Biotite forms a few phenocrysts up to 1.2 mm in size. Several patches up to 1.5 mm in size may have been original phenocrysts. They are replaced by finer grained, metamorphic biotite, which commonly has very irregular outlines and is intergrown with extremely fine grained quartz. Pleochroism is from straw to medium brown. A few flakes are altered strongly to completely to pseudomorphic chlorite and patches of epidote.

One patch 1.5 mm long at the edge of the section may be secondary after a subhedral, prismatic hornblende phenocryst. It is dominated by very fine grained biotite with lesser quartz, and minor patches of opaque and single grains of apatite. Apatite grains are prismatic and up to 0.2 mm long. Elsewhere, apatite forms a few subhedral grains in quartz and feldspars averaging 0.05-0.07 mm in size.

Several interstitial patches averaging 0.1-0.2 mm in size consist of subradiating to irregular aggregates of very fine grained flakes of chlorite with pleochroism from pale to medium green. One irregular patch up to 1.3 mm across consists of extremely fine grained, radiating clusters of chlorite averaging 0.03 mm across, with minor interstitial Ti-oxide between the clusters.

Opaque forms anhedral equant grains averaging 0.02-0.05 mm in size, and a few tabular grain up to 0.15 mm long, both mainly with biotite.

Zircon forms one acicular grain up to 0.07 mm long in a few quartz grains and and in the hornblende(?) phenocryst.

Sample 88-180 **Marble with Lenses of Plagioclase-Biotite-Quartz-(Tremolite) Schist**

The rock is a medium grained marble containing abundant wispy lenses of plagioclase-quartz-biotite schist from 0.3-1 mm in width, and some bands up to 3 mm wide containing intimate intergrowths of calcite and silicates. Tremolite forms a few porphyroblasts and fibrous clusters.

calcite	65-70%
plagioclase	12-15
quartz	8-10
biotite	7- 8
tremolite	3- 4
Ti-oxide	0.3
opaque	0.2
sphene	0.1
apatite	trace

Calcite-rich lenses consist of grains averaging 0.2-0.5 mm in size, with a few grains up to 1.5 mm across. Some of these layers contain patches of quartz averaging 0.1-0.2 mm in size. In layers intergrown with silicates, calcite commonly forms elongate grains averaging 0.05-0.1 mm in length oriented parallel to foliation.

Plagioclase occurs in lenses averaging 0.2-0.8 mm in width. Grains are oriented parallel to foliation and elongate, averaging 0.05-0.2 mm in length. Intergrown with plagioclase are wispy streaks of Ti-oxide parallel to foliation.

Some lenses and layers are dominated by quartz with lesser calcite and silicates. Quartz grains average 0.05-0.15 mm size.

Biotite is concentrated in layers up to 3 mm wide in which it is intergrown intimately with calcite. Biotite flakes average 0.05 mm in size. Pleochroism is from pale to medium brown. In these layers, plagioclase forms disseminated, extremely fine grains containing moderately abundant dusty opaque. Biotite also is moderately abundant in a few plagioclase-rich lenses; in these it forms flakes averaging 0.05-0.2 mm long oriented parallel to foliation.

Tremolite occurs as subradiating to radiating patches averaging 0.1-0.3 mm in size of fibrous grains averaging 0.1 mm long. A few lenses up to 2 mm long consist of these aggregates. Bordering a few calcite-rich layers are scattered aggregates of subradiating, prismatic grains from 0.5-1.2 mm long.

Opaque is concentrated in a few lenses as anhedral grains averaging 0.03-0.1 mm in size. It also forms disseminated grains averaging 0.03-0.07 mm in size.

Sphene forms irregular grains averaging 0.05-0.2 mm in size.

Apatite forms subhedral grains averaging 0.05-0.07 mm long.

Sample 88-183 **Banded Calc-silicate Rock: Plagioclase-Diopside-Quartz-Chlorite-K-feldspar-Tremolite/Actinolite; Veins and Veinlets of Epidote-K-feldspar-(Tremolite)**

The rock is strongly compositionally banded, with layers rich in one or more of plagioclase, diopside, quartz, chlorite, and K-feldspar, with lesser, disseminated tremolite/actinolite and sphene. A vein and a few veinlets are of epidote-K-feldspar.

plagioclase	40-45%	sphene	0.7%
diopside	20-25	Ti-oxide	0.2
quartz	17-20	hematite	minor
chlorite	7- 8	epidote	minor
K-feldspar	4- 5	apatite	trace
tremolite/actinolite	1- 2		
veins and veinlets			
epidote-K-feldspar-(tremolite)	2- 3		

Plagioclase forms anhedral grains averaging 0.03-0.08 mm in size in most layers, with slightly coarser or finer grains dominant in a few layers. Alteration is slight to sericite.

Diopside is concentrated in a few layers as anhedral granular grains averaging 0.02-0.2 mm in size and locally as subhedral prismatic grains averaging 0.3-0.7 mm in size. Larger prismatic grains generally are oriented parallel to foliation. In one coarser grained layer, it forms several porphyroblasts averaging 1.5-2 mm across.

Quartz is concentrated in layers up to 1.5 mm wide as anhedral. equant grains averaging 0.0005-0.1 mm in size. In many of these layers it is intergrown intimately with K-feldspar grains up to 0.5 mm in size. A few quartz-rich layers contain moderately abundant tremolite/actinolite grains averaging 0.1-0.2 mm in size; some of these have skeletal outlines.

K-feldspar is concentrated in seams up to 1 mm wide, with or without quartz, as grains averaging 0.05-0.3 mm in size, and in finer grained seams with quartz, chlorite, and plagioclase.

Chlorite is concentrated in some layers with plagioclase as clusters of very fine grained flakes, commonly containing patches of Ti-oxide. It is colorless to very pale green.

Tremolite/actinolite forms scattered, commonly ragged prismatic grains averaging 0.1-0.2 mm in size in quartz and plagioclase. Pleochroism is from pale to light yellowish green. A few clusters up to 0.3 mm in size are of extremely fine grained, fibrous aggregates.

Sphene forms moderately abundant, anhedral, equant to slightly elongate grains up to 0.4 mm across, mainly associated with coarse grained diopside.

Epidote forms a few lensy aggregates up to 1 mm long parallel to foliation adjacent to the vein.

Ti-oxide (semiopaque) is concentrated moderately in cryptocrystalline seams associated with some finer grained layers dominated by plagioclase and lesser chlorite.

Hematite forms a few patches up to 0.03 mm in size of cryptocrystalline aggregates, mainly in K-feldspar and quartz.

Apatite forms subhedral prismatic grains averaging 0.08-0.12 mm long.

A vein averaging 0.5 mm wide is dominated by fine to very fine grained epidote, with scattered patches of very fine grained K-feldspar, and local patches of extremely fine grained, fibrous tremolite(?).

Sample 88-203 **Well Foliated Calcareous Calc-silicate/Marble**

The rock is well banded and consists of intimately intergrown, irregular lenses of about equal amounts of calc-silicate and marble. The calc-silicate is dominated by diopside and lesser plagioclase/epidote, with lesser K-feldspar and chlorite, and accessory garnet, biotite/phlogopite, and opaque.

calcite	40-45%
diopside	35-40
plagioclase	7- 8
epidote	4- 5
K-feldspar	4- 5
chlorite	2- 3
garnet	1
opaque/hematite	0.2
biotite	0.2
sphene	0.1
veinlet epidote	0.2

Calcite forms equant grains averaging 0.2-0.5 mm in size. Calcite-rich lenses generally are relatively free of calc-silicates.

Diopside forms irregular, interlocking aggregates of grains averaging 0.1-0.5 mm in size.

Plagioclase forms anhedral to subhedral grains averaging 0.05-0.2 mm in size. Some patches of plagioclase are altered to extremely fine grained to cryptocrystalline patches of epidote.

K-feldspar forms equant grains averaging 0.05-0.2 mm in size, and locally is concentrated in lenses of interlocking grain averaging 0.1-0.3 mm in grain size.

Chlorite is concentrated in a few layers as clusters of flakes averaging 0.07-0.15 mm in size, mainly intergrown with plagioclase and lesser diopside.

Garnet forms a few patches of anhedral grains with anomalous extinction up to 1.5 mm in size, intergrown with diopside, and in part containing extremely fine grained inclusions of diopside(?).

Opaque (pyrite?) forms grains averaging 0.03-0.1 mm in size. Some are replaced in part by red-brown hematite. Lenses up to 0.1 mm long of ilmenite(?) are parallel to foliation in a few plagioclase-rich lenses. Some of these are rimmed by and altered to Ti-oxide. Several wispy lenses contain disseminated grains of opaque averaging 0.01 mm in size in diopside and in calcite.

Biotite forms flakes averaging 0.05 mm in size concentrated in a few seams parallel to foliation with Ti-oxide and minor opaque. Pleochroism is from pale to light/medium brown.

Sphene forms subhedral to anhedral grains averaging 0.05-0.3 mm in size.

A veinlet 0.1 mm wide is of very fine grained epidote.

Sample 88-260-1 **Plagioclase-Diopside-Quartz-Opaque Calc-silicate Rock; Lenses of Feldspar-Biotite Schist; Veins of Quartz-Opaque-Epidote-Tremolite/Actinolite-Diopside**

The rock is a variably banded calc-silicate dominated by plagioclase, diopside, quartz, and opaque, with lesser tremolite/actinolite and minor sphene. A few lenses up to a few mm wide (7 mm in hand sample) are of feldspar-biotite schist. Veins of quartz-opaque-epidote-tremolite/actinolite-diopside-biotite cut the rock in several directions. Some veins have alteration halos in the schist in which biotite is altered to chlorite.

calc-silicate rock	(80% of sample)
plagioclase	55-60%
diopside	20-25
quartz	12-15
opaque (hematite)	4- 5
tremolite/actinolite	2- 3
sphene	0.3
apatite	trace

Plagioclase forms anhedral grains averaging 0.02-0.05 mm in size.

Diopside forms anhedral, equant grains averaging 0.03-0.2 mm in size intergrown with plagioclase. Larger grains (0.3-1 mm) are concentrated moderately in a few layers parallel to foliation; associated with diopside in these layers is minor to moderately abundant opaque, and minor sphene and quartz. A few ragged porphyroblasts are up to 1.5 mm long, and elongated parallel to foliation.

Quartz is concentrated in several patches and lenses as grains averaging 0.05-0.08 mm in size.

Opaque forms irregular patches up to 0.8 mm in size of extremely fine grained aggregates, commonly associated with diopside..

Actinolite/tremolite forms ragged to subhedral porphyroblasts and clusters of porphyroblasts averaging 0.3-0.5 mm in grain size. Pleochroism is from pale to light green. A few grains up to 0.1 mm in size of actinolite/hornblende have pleochroism from light/medium yellowish green to medium green to slightly bluish green.

Sphene forms equant grains averaging 0.1-0.15 mm in size, commonly associated with diopside.

Apatite forms anhedral, equant grains averaging 0.1-0.25 mm across.

schist (12% of sample)

plagioclase	55-60%
biotite	15-17
K-feldspar	4- 5
opaque	1-

Plagioclase and K-feldspar occur as anhedral grains averaging 0.01-0.02 mm in size, intergrown intimately with biotite flakes and much less opaque lenses of similar grain size. Aggregates are strongly foliated. Some layers are gradational between the two main types, being well foliated and dominated by extremely fine grained plagioclase, with lesser very fine grained quartz and diopside. In few layers and in broad halos bordering some of the veins, biotite is altered to pseudomorphic chlorite.

(continued)

veins (8% of sample)	
quartz	55-60
opaque	17-20
tremolite/actinolite	12-15
epidote	4- 5
diopside	3- 4
biotite	1- 2

Veins up to 0.8 mm wide are dominated by fine grained quartz with patches dominated by one or more of opaque, tremolite/actinolite, epidote, and diopside. Tremolite/actinolite is pale to light green as in the host rock.

Opaque forms ragged patches averaging 0.1-0.5 mm in size in many veins. In the largest quartz-rich vein, it forms aggregates of fine to medium grains, which in places occupy the entire width of the vein. Interstitial to opaque in this vein are grains of epidote up to 0.6 mm in size, and a few grains of sphene up to 0.2 mm across.

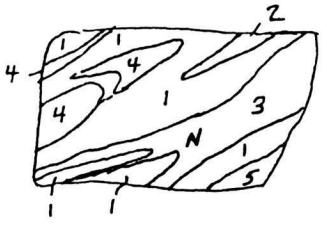
Epidote also forms several, commonly braided veinlets up to 0.1 mm wide, in which it is associated with tremolite/actinolite, opaque and lesser biotite.

Diopside forms several patches of grains averaging 0.1-0.3 mm in size in one of the larger veins.

Biotite forms very fine to extremely fine grained aggregates in lensy patches with epidote or tremolite/actinolite. Pleochroism is from pale to light greenish brown.

Sample 88-365-2 **Deformed Banded Calc-silicate: Plagioclase-Epidote-Diopside-(Garnet-Quartz-Chlorite-Tremolite); Replacement Patches of Epidote-Calcite, Veinlets of Epidote**

The rock is strongly folded and compositionally zoned as indicated in the sketch below (Note: replacement patches of epidote-(calcite) are not shown on the sketch).



Zone 1 **Epidote-rich, extremely fine grained**

This zone is strongly foliated and dominated by cryptocrystalline epidote with disseminated grains of quartz (10-12%) averaging 0.01-0.03 mm in size. Epidote probably is mainly after plagioclase. Opaque (trace) forms wispy lenses parallel to foliation. This zone commonly shows tight warps and kinks in foliation. It contains a few coarser grained patches up to 0.5 mm long of epidote (0.05-0.1 mm grain size) and a few diopside-rich lenses of similar size and grain size.

Zone 2 **Quartz-Chlorite-Tremolite**

This zone is enclosed by Zone 1 and is somewhat gradational in texture into it. Quartz (40-50%) forms grains averaging 0.02-0.05 mm in size. These are surrounded by extremely fine grained aggregates of chlorite, tremolite, and epidote, and enclosed in a few coarser skeletal grains of chlorite. Opaque and Ti-oxide (1-2%) form extremely fine grained lenses parallel to foliation. Foliation is warped tightly in a few kink folds whose axial planes are parallel to the main foliation in the rock.

Zone 3 **Plagioclase-Diopside replaced by Epidote-Calcite**

This zone is composed of an intimate intergrowth of plagioclase and diopside. In much of the zone, plagioclase forms equant grains averaging 0.03-0.1 mm in size surrounded by granular aggregates of diopside averaging 0.01-0.02 mm in size. In the fold nose (marked "N") on the sketch, the zone is replaced by a fine grained aggregate of epidote and lesser, commonly interstitial calcite. Near this replacement patch are a few lenses of plagioclase-diopside averaging 0.05-0.15 mm in size. Opaque (pyrite?) forms disseminated, equant, anhedral patches averaging 0.05-0.2 mm in size.

Zone 4 **Plagioclase-Diopside replaced by Epidote**

This zone is similar to the coarser grained part of Zone 3. Replacement patches up to a few mm across are of of fine to locally medium grained epidote, which commonly contain relic inclusions of extremely fine grained diopside.

Zone 5 **Diopside-Plagioclase-Garnet-(Quartz-Epidote)**

Zone 5 is dominated by granular diopside averaging 0.02-0.07 mm in grain size, with lesser plagioclase averaging 0.05-0.1 mm in size. Garnet (4-5%) forms disseminated grains and clusters of grains averaging 0.07-0.2 mm in size. Quartz and calcite are minor interstitial minerals, forming grains averaging 0.05-0.07 mm in size. Epidote (3-4%) with lesser calcite forms a few patches up to 0.7 mm long by 0.15 mm wide interstitial to garnet and diopside. Opaque (1-2%) (pyrite altered partly to hematite) forms scattered subhedral to anhedral grains averaging 0.05-0.2 mm in size.

The rock is cut by a few discontinuous, lensy veinlets up to 0.07 mm wide of epidote, and by two veinlets 0.01-0.02 mm wide of chlorite(?).

Sample 88-413 Porphyritic Hornblende-Biotite Potassic Quartz Diorite

Phenocrysts of hornblende, clusters and minor phenocrysts of biotite, and minor phenocrysts of plagioclase are set in a groundmass of plagioclase and quartz, with lesser biotite and minor K-feldspar.

phenocrysts			
hornblende	4- 5% (in rock; 1-2% in section)		
biotite clusters	2- 3		
plagioclase	2- 3		
groundmass			
plagioclase	60-65	opaque	0.3%
quartz	17-20	apatite	0.2
biotite	4- 5	zircon	trace
K-feldspar	3- 4		

In the hand sample, hornblende forms subhedral phenocryst up to 1.3 cm long. These are poorly represented in the thin section. Some are recrystallized moderately to much finer grained aggregates in slightly disoriented positions. Along their borders are replacement patches and overgrowths of aggregates of fine grained biotite, with lesser opaque and apatite. Pleochroism of hornblende is from pale to medium green. Some grains are replaced by pseudomorphic actinolite with pleochroism from pale to light green.

A few ragged clusters up to several mm across consist of biotite flakes averaging 0.5-1 mm in size. Biotite also forms a few phenocrysts up to 2 mm across. Phenocrysts commonly have very irregular outlines. Pleochroism is from light to medium/dark brownish green to brown. Some of the clusters contain a few ragged grains of hornblende averaging 0.15-0.2 mm in size.

Plagioclase forms anhedral to subhedral grains averaging 1-2 mm in size. Many show strong compositional zoning from broad cores of about **An40-45** to narrow rims of about **An30-35**. Alteration is concentrated in cores of grains and is weak to moderate to sericite and much less epidote. Many grains appear altered in very irregular, very fine patches to more-sodic plagioclase or possibly K-feldspar.

Quartz forms anhedral grains averaging 0.5-2 mm in size, commonly interstitial to subhedral plagioclase. Some grains contain minor inclusions of plagioclase averaging 0.1-0.2 mm in size.

Biotite forms subhedral to anhedral flakes averaging 0.3-0.1 mm in size. Pleochroism is from pale to medium/dark greenish brown to brown, with a few grains having a slightly reddish brown color. A few flakes are altered in ragged patches along cleavage to pseudomorphic chlorite and minor Ti-oxide, and a few of these contain a few anhedral grains up to 0.3 mm in size of epidote.

K-feldspar forms interstitial grains averaging 0.5-1.5 mm in size. Many contain inclusions of subhedral to euhedral prismatic, and anhedral, equant plagioclase grains averaging 0.1-0.2 mm in size.

Hornblende forms a few grains in the groundmass averaging 0.1-0.3 mm in size. Pleochroism is from light to medium green or bluish green.

Opaque forms anhedral grains averaging 0.07-0.2 mm in size, mainly associated with biotite. One elongate patch 1 mm long occupies an interstitial wedge among plagioclase grains. It is altered to deep red-brown hematite along its borders.

Apatite forms subhedral to euhedral prismatic to equant grains averaging 0.05-0.15 mm in size, mainly associated with biotite. A few subhedral apatite grains in feldspars and quartz average 0.07-0.2 mm in length, with one subhedral prismatic grain up to 0.4 mm long.

Zircon forms a few anhedral grains up to 0.02 mm in size in biotite; they have weak pleochroic halos.

Sample 88-414 **Leucocratic (Biotite-Muscovite) Quartz Monzonite**

Scattered phenocrysts of quartz, plagioclase, K-feldspar and biotite are set in a groundmass of K-feldspar, plagioclase, and quartz, with minor biotite and muscovite.

phenocrysts	
quartz	2- 3%
plagioclase	2- 3
K-feldspar	1
biotite	1
groundmass	
K-feldspar	30-35
plagioclase	25-30
quartz	20-25
biotite	2- 3
muscovite	3- 4
apatite	minor
hematite	minor

K-feldspar forms a few anhedral phenocrysts up to 1.7 mm long; these are Carlsbad twins with somewhat irregular twin contacts. Dusty hematite inclusions are common. In the groundmass K-feldspar forms anhedral grains averaging 0.5-1 mm in size.

Plagioclase forms anhedral to subhedral grains averaging 0.5-1.5 mm in size, with a few up to 2 mm across. Some grains show strong growth zones, with broad cores of **An35-40** grading sharply to thin rims of **An15-20**. Alteration is slight to locally strong to sericite, and is concentrated in cores of grains. Some grains are replaced moderately to strongly by irregular patches of K-feldspar.

Quartz forms a few, equant, anhedral phenocrysts from 1.5-2.5 mm in size; these have irregular borders intergrown with the groundmass, and a few contain moderately abundant inclusions of groundmass minerals. In the groundmass, quartz forms anhedral grains and patches averaging 0.2-0.5 mm in grain size.

Biotite forms ragged flakes averaging 0.5-0.8 mm in length, with a few up to 1.5 mm across, in part concentrated in clusters up to 2 mm in size. Alteration is strong to complete to pseudomorphic chlorite with lesser Ti-oxide, and locally minor epidote. In some grains, wispy lenses parallel to foliation contain extremely fine grained sericite and/or quartz and plagioclase.

Muscovite forms clusters of ragged to subhedral flakes averaging 0.1-0.2 mm in size, in part after plagioclase, and in part probably primary. Some clusters have a subradiating texture. Associated with a few are a few clusters of chlorite flakes of similar grain size.

Hematite forms clusters of anhedral to subhedral grains averaging 0.03-0.05 mm in size in plagioclase.

Apatite forms anhedral, equant grains averaging 0.02-0.05 mm in size, commonly associate with biotite, and a few subhedral to euhedral prismatic grains up to 0.2 mm long..

Sample 88-470 Altered Peridotite cut by vein of Chlorite/Serpentine-Tremolite

The sample contains ragged relic grains of olivine, opaque and possibly altered clinopyroxene in a groundmass of tremolite-chlorite-opaque. A late vein is of chlorite/serpentine and tremolite.

olivine	25-30%
serpentine	2- 3
magnetite-opaque	4- 5
clinopyroxene(?)	4- 5
tremolite	45-50
chlorite	7- 8
talc	0.5
epidote(?)	trace
apatite	trace
vein	
chlorite/serpentine	2- 3
tremolite	1- 2

Olivine forms ragged, anhedral grains averaging 0.5-2 mm in size. Grains are fractured strongly and replaced along veinlets averaging 0.03 mm wide by serpentine and magnetite. Serpentine forms aggregates oriented perpendicular to the walls of the fractures.

Tremolite forms subhedral to euhedral grains up to 1.7 mm in size. Many of these contain abundant ragged patches of magnetite. These may be secondary after original clinopyroxene.

Tremolite also forms secondary prismatic to fibrous aggregates of colorless grains in random orientation, with grain size averaging 0.2-0.5 mm in size, with a few up to 1 mm. A few of these occur in olivine, and some appear to postdate the major period of fracturing in olivine.

Chlorite forms patches of extremely fine to locally very fine grains interstitial to olivine and to tremolite. Locally it shows a subradiating texture. Chlorite is nearly colorless with grey and locally anomalous blue birefringence. Patches of chlorite interstitial to olivine generally are free of opaque inclusions.

Locally associated with chlorite are irregular patches of extremely fine grained talc. A few patches contain extremely fine grains of a mineral of high relief, possibly epidote, intergrown intimately with chlorite.

Primary opaque (partly magnetite) forms a few anhedral, equant grains averaging 0.2-0.3 mm in size, commonly intergrown with olivine.

Secondary opaque (in part magnetite), forms a few aggregates up to 0.7 mm across. It is strongly concentrated in a few other patches averaging 0.5-0.8 mm is in which it is intergrown with tremolite. Elsewhere, it forms disseminated, extremely fine grains in tremolite aggregates and to a lesser extent in olivine grains.

Apatite forms a few subhedral to euhedral prismatic grains up to 0.4 mm long. They commonly have grey cores caused by abundant dusty opaque inclusions.

One late vein up to 0.8 mm wide cuts the rock. Where the vein cuts olivine, the latter is altered to light greyish brown chlorite/serpentine along a closely spaced network of parallel, braided fractures. Where the vein cuts tremolite, tremolite was recrystallized into ragged, prismatic to feathery aggregates oriented more or less along the length of the vein.

Sample 88-477 **Foliated Feldspathic Dunite altered to Tremolite; Vein of Serpentine/Chlorite-Magnetite; Late Vein of Ankerite**

Compositional layering between bands of coarser grained olivine and finer grained bands of olivine-(plagioclase) define a prominent banding in the rock, which probably was primary. Elongation of olivine grains in the coarser layers may have formed by recrystallization during deformation, but this is not definite. Olivine (and possibly plagioclase) is altered in irregular patches to tremolite.

olivine	50-55%
plagioclase	4- 5
tremolite	35-40
opaque	2- 3
apatite	trace
veins	
1) serpentine/chlorite-magnetite	1- 2
2) ankerite	0.1

Olivine forms anhedral, elongate grains averaging 1-2 mm in size, with a few up to 5 mm long. These are concentrated in lenses and bands parallel to a moderate primary foliation. Interbanded with these are primary zones of much finer grained, equant grains of olivine averaging 0.1-0.2 mm in size, and secondary zones dominated by tremolite, possibly after finer grained olivine-(plagioclase). Coarser olivine is fractured moderately along irregular fractures, and along a few of these is altered to serpentine-magnetite.

Intergrown with some finer grained bands of olivine is interstitial plagioclase as grains averaging 0.03-0.1 mm in size.

Opaque forms primary anhedral, equant grains averaging 0.1-0.15 mm in size, with a few up to 0.7 mm in size.

Tremolite forms unoriented aggregates of extremely fine to very fine grain size, which replace olivine, partly in bands averaging 0.5-1.5 mm wide parallel to foliation, and partly in irregular patches and seams, in part controlled by fractures in coarser olivine grains. A few ragged to subhedral prismatic grains of tremolite are up to 0.7 mm long.

Apatite forms a few clusters of subhedral, prismatic grains averaging 0.15 mm in length. They contain moderately abundant dusty opaque inclusions giving the grains a light grey appearance.

Parallel to foliation are a few late, braided vein zones up to 0.6 mm wide in which olivine is altered to chlorite/serpentine and magnetite.

Two subparallel, late, crosscutting, braided veinlets up to 0.05 mm wide are of extremely fine grained ankerite. They do not intersect the other vein.

67FLAG(LEE)-1

SHEET 1 OF 3.

ANVIL MINING CORPORATION LIMITED
Whitehorse, Yukon
PROPERTY NAME LEE (FLAGSTONE)
LOCATION 16E 2S
DATE DRILLED SEPT 19, 1967 - Oct 6, 1967
SCALE OF LOG 1" → 40' LOGGED BY J. GONDI DATE Oct 9, 1967

HOLE NO 67-FLAG1 DEPTH 126 FEET.
COLLAR ELEVATION ..... CORE SIZE AQ INCLINATION TESTS
BEARING ..... (MAG OR TRUE DIP 90°
CO-ORDINATES ..... N. ..... E.
SURFACE Y OR UNDERGROUND .....
TOTAL RECOVERY 89%

ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	% RECOVERY	SAMPLE NO.	INTERVAL FROM	INTERVAL TO
0						
0-22.5'- OVERBURDEN.	FOLIATION:- 20°.					
22.5'-160'- QUARTZ BIOTITE CHLORITE SERICITE SCHIST. (GARNETIFEROUS).	22.5-79.6'- LEACHED AND IRON OXIDES FORMED ALONG FRACTURE PLANES. IRREGULAR QUARTZ BLEBS AND VEINS OCCUR THROUGHOUT THE CORE.	22.5 27.0 32.5 37.5	3.4 2.8 4.6			
40						
GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	DISSEMINATED GARNETS. CRENULATED AT 86'. AT SOME PLACES GARNETS PARTLY ALTERED TO CHLORITE.	52.0	13.7 22.8			
80		73.5 78.5	2.8 5.5			
GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	RICH IN CHLORITE AT 94'-95' & 98.5-99'. FOLIATION:- 25°. DISSEMINATED PYRITE AT SOME PLACES. 126'- PYRITE OCCURS ALONG FRACTURES.	84.0 90.0 93.5 102.5 107.5 115.0 120.5	5.0 3.2 8.7 5.0 6.8 5.3 3.5			
120						
ICD "	128'-130'- RICH IN GARNETS. PARTLY ALTERED TO CHLORITE. A MINOR AMOUNT OF PYRITE OCCURS ALONG FRACTURES. 138'- RICH IN GARNETS. FOLIATION:- 40°.	123.5 127.5 134.0 137.0 141.0 150.0 157.0	1.5 2.0 6.5 3.0 4.0 9.0 7.0 5.0			
160						
160-167- GRANITE. 10AB	Coarse Granite. MICACEOUS IN PLACES.	162.0 165.0	3.0 7.6			
167-269.5' - GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	FOLIATION:- 20°. 167-280- RICH IN CHLORITE. 191'- CRENULATED.	173.0 183.4 185.0 187.0 191.0 197.0 200.0	2.6 1.6 2.0 4.0 6.0 3.0 7.0			
200						
ICD	230-241- RICH IN CHLORITE AND GARNETS. AN INCREASE IN PYRITE. 234- QUARTZ VEINS. PYRITE OCCURS ALONG WITH THEM.	201.0 208.0 214.0 215.5 222.5 229.0 234.5	1.8 6.0 1.5 7.0 6.5 5.5 6.0			
240						

ANVIL MINING CORPORATION LIMITED Whitehorse, Yukon
PROPERTY NAME .L.E.E.(FLAGSTAFF)..... HOLE NO.67-FLAG1 SCALE OF LOG 1" → 40'

240	ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	% RECOVERY	SAMPLE NO.	INTERVAL FROM	INTERVAL TO
	GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	PYRITE ALSO OCCURS IN SCHIST. MARCASITE IS SOMETIMES NOTICED.	240.5				
	269.5'- 277'— MICACEOUS GRANITE. 10AB [10CD	A MINOR AMOUNT OF PYRITE & MARCASITE ALONG FRACTURES.	246.5	6.0			
	277'- 394'— GARNETIFEROUS		252.0	6.0			
			255.0	3.0			
			264.0	9.0			
			274.0	10.0			
			277.0	3.0			
280	QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	278.5'— QUARTZ VEIN OF 5" WIDE. DISSEMINATED PYRITE.	287.0	10.0			
	1CD		294.0	7.0			
		306.6'— CRENULATED.	300.0	6.0			
		313— FOLIATION - 25°.	310.0	10.0			
		CRENULATED AT 315'.	318.0	8.0			
320			321.0	3.0			
		FOLIATION:- 40°	331.0	10.0			
		354- CRENULATED.	338.0	7.0			
			344.0	6.0			
			354.0	10.0			
360			360.0	6.0			
	394- 400.4- 10AB aplite	373.6'-375'— QUARTZ VEIN, ASSOCIATED WITH IS PYRITE.	366.0	3.0			
	PEGMATITIC VEIN.		369.0	7.5			
			376.5	1.5			
		VERY COARSE QUARTZ, FELDSPAR MICACEOUS.	378.0	9.0			
			388.0	7.0			
			394.0	4.2			
400			398.2	3.8			
	400.4'- 482.5'— GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	FOLIATION:— 28°	402.0	10.0			
			412.0	7.6			
			420.0	2.5			
			424.0	8.7			
			434.0	6.4			
440			441.0	4.0			
	1CD		445.0	5.0			
			450.0	4.0			
			454.0	10.0			
			464.0	7.5			
	10AB		471.5	5.5			
480			477.0	5.0			
	482.5'— 489'- MICACEOUS GRANITE.	PYRITE & MARCASITE ALONG FRACTURES.	482.0	3.0			
			485.0	4.1			
	1CD		489.1	3.9			
	489- 726'— GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.		493.0	8.0			
			501.0	2.0			
			503.0	3.6			
			506.6	1.4			
			508.0	9.0			
520			517.0				

ANVIL MINING CORPORATION LIMITED Whitehorse, Yukon
PROPERTY NAME LEE (FLAGSTONE) ..... HOLE NO 67-FLAG I SCALE OF LOG 1" → 40'

ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	% RECOVERY	SAMPLE NO.	INTERVAL FROM	INTERVAL TO
GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	CRENULATED AT 534.5'. PYRITE AND A MINOR AMOUNT OF MARCASITE ALONG FRACTURES.	527.0	9.6			
		537.0	9.3			
		539.0	2.0			
		549.0	10.0			
		556.0	7.0			
		560.0	4.0			
"	QUARTZ VEIN AT 570.4 OF FIVE INCHES WIDE.	560.0	9.0			
		579.0	10.0			
		583.0	4.0			
		593.0	10.0			
		598.0	5.0			
" ICD		608.0	10.0			
		618.0	10.0			
		626.0	8.0			
		630.0	4.0			
		633.0	3.0			
		635.0	2.000			
		640.0	5.000			
"		648.0	8.000			
		658.0	2.000			
		662.0	4.000			
		676.0	10.0			
		686.0	8.0			
		694.0	11.0			
"		685.0	10.0			
		695.0	11.0			
		706.0	10.0			
		716.0	10.0			
GARNETIFEROUS QUARTZ BIOTITE CHLORITE SERICITE SCHIST.	726' – END OF HOLE.	726.0				

67 FLAG (LEE) -2

ANVIL MINING CORPORATION LIMITED
Whitehorse, Yukon
PROPERTY NAME LEE (FLAGSTONES)
LOCATION 3000 S 500 W.
DATE DRILLED 25 Oct. 1967 – 27 Nov. 1967.
SCALE OF LOG 1" → 40' LOGGED BY J. GONDI DATE 23 NOV. 1967

HOLE NO. 67-FLAG II DEPTH 801'
COLLAR ELEVATION ..... CORE SIZE AQ INCLINATION TESTS
BEARING ..... (MAG OR TRUE DIP 90°
CO-ORDINATES ..... N. ..... E.
SURFACE ✓ OR UNDERGROUND .....
TOTAL RECOVERY 94.1%

SHEET 1 OF 4

ROCK TYPES AND ALTERATION		MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	Ft. RECOVERY	SAMPLE No.	INTERVAL FROM	INTERVAL TO
0							
0 – 34 – OVER BURDEN 34 – 72.5 – QUARTZITE		HARD MASSIVE IMPURE QUARTZITE WITH CHLORITE IN PLACES. SILICA CONTENT OF ORIGINAL SEDIMENTS RECRYSTALLIZED AND METAMORPHOSED.	34 37	1.6			
40			45	1.5			
QUARTZITE. 3D 72.5 – 108.3 QUARTZ BIOTITE CHLORITE		PYRITE FILLS FRACTURES IN QUARTZITE AND ALSO OCCURS AS DISSEMINATED.	55	8.7			
		AT 72' – A MINOR AMOUNT OF BIOTITE AND CHLORITE.	65	8.2			
	72.5	CONTACT GRADATIONAL.	72	7.0			
80		FOLIATION: 25°		11.0			
SCHIST.		SEGGREGATED BANDS OF QUARTZ AND BIOTITE CHLORITE SCHIST IMPART A BANDED APPEARANCE.	83	7.5			
		FINELY FOLIATED SCHIST.	100.5	6.5			
CHLORITE SCHIST. 3C →	108.3 115.7	DISSEMINATED PYRITE ALONG FRACTURE FOLIATION: – 72° PURE CHLORITE SCHIST BAND.	107 111.6	4.6 9.0			
120			120.6				
115.7 – 179 – QUARTZ BIOTITE CHLORITE SCHIST 3D		FOLIATION: – 65°		9.4			
		FINELY FOLIATED QUARTZ BIOTITE CHLORITE SCHIST WITH CONFIRMABLE BANDS OF QUARTZ AT IRREGULAR INTERVALS CONSIST	130	10.0			
			140	8.0			
			148	9.8			
160			157.8				
179 – 382.5 – QUARTZ CHLORITE BIOTITE SCHIST.		OF PYRITE IN DISSEMINATED FORM ALONG FRACTURES. PYRRHOTITE IN SOME PLACES.	168.6	9.6			
	179			9.6			
		FOLIATION: – 63°	177	5.5			
		WITH INCREASING CHLORITE, THE SCHIST GRADUALLY PASSES INTO QUARTZ CHLORITE BIOTITE	181	9.0			
			190	10.0			
200			200				
30 [illegible] no marker of count	203	SCHIST. 181.3 – 181.7 = CHLORITE SCHIST.	204.6	4.6			
		DISSEMINATED PYRITE.	215.6	10.4			
		203.7 – PYRRHOTITE.		10.0			
		204 – 206 – RICH IN CHLORITE.	225.6	6.4			
		218 – PYRITE ALONG FRACTURES	232				
		224.6 – 228.5 – CRENULATED.					
240		229 – 232 – CHLORITE SCHIST.					

ANVIL MINING CORPORATION LIMITED

PROPERTY NAME ..LEE. (FLAGSTONE)..... HOLE NO. 67-FLAG II SCALE OF LOG 1" = 40'

240	ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	# Ft. RECOVERY	SAMPLE NO.	INTERVAL FROM	INTERVAL TO
	QUARTZ CHLORITE BIOTITE SCHIST.	FOLIATION:- 65°	242	7.8			
			249	8.4			
			258	10.0			
			268				
		278-279- CHLORITE SCHIST.		16.0			
280	QUARTZ CHLORITE BIOTITE SCHIST.	FOLIATION:- 72°.	284	8.0			
		SEGGREGATED BIOTITE & CHLORITE IMPART A BANDED APPEARANCE.	292	6.0			
			298	14.7			
		QUARTZ VEINS AT 309.6-310 & 314.6-315.	313	8.6			
320	QUARTZ CHLORITE BIOTITE SCHIST.	QUARTZ VEIN AT 325.9-326.2	322.6	9.7			
		327.1-327.4- CHLORITE SCHIST.	332.6				
		IRREGULAR QUARTZ VEINS.		9.4			
		341.5- PYRRHOTITE	342				
		347.9-348.2- CHLORITE SCHIST.		9.7			
	352.5 - 372.	IN SOME PLACES INCLUSIONS AND APPEAR TO BE METAMORPHOSED VOLCANICS.	352	8.5			
360	QUARTZ BIOTITE CHLORITE SCHIST.	FOLIATION:- 72°	360.8	9.8			
		368.2- PYRITE.	370.6	4.4			
		FOLIATION:- 75°.	375	10.0			
		PYRITE FILLING FRACTURES.	385	9.0			
	372-396- QUARTZ CHLORITE BIOTITE SCHIST.		394				
	396-627.6	FOLIATION:- 73°		10.0			
400	QUARTZ BIOTITE CHLORITE SCHIST.	396.7- DISSEMINATED PYRITE.	404	9.3			
		412.9-414.3- METAMORPHOSED VOLCANICS.	414.3	4.7			
			419	10.0			
		IRREGULAR QUARTZ VEINS OCCUR THROUGHOUT.	429	10.0			
		424.6- CRENULATED.	439				
440	QUARTZ BIOTITE CHLORITE SCHIST.	FOLIATION:- 81°	445	8.0			
		RICH IN CHLORITE IN PLACES.	453	8.0			
		SEGGREGATED BIOTITE IMPART A BANDED APPEARANCE.	463.3	9.6			
			473.7	9.8			
				8.3			
480	QUARTZ BIOTITE CHLORITE SCHIST.	490.4- DISSEMINATED PYRITE	482	10.6			
		515- RICH IN BIOTITE.	492.6	15.8			
		QUARTZ VEINS OCCUR IRREGULARLY THROUGHOUT. DISSEMINATED PYRITE ALONG FRACTURES.	509				
520							

ANVIL MINING CORPORATION LIMITED Whitehorse, Yukon

PROPERTY NAME LEE (FLAGSTONE) HOLE NO. 67-FLAG II SCALE OF LOG 1" = 40'

	ROCK TYPES AND ALTERATION		MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	FT. RECOVERY	SAMPLE NO.	INTERVAL FROM	INTERVAL TO
520					26.8			
	QUARTZ BIOTITE CHLORITE SCHIST.		SAME AS IN THE INCREMENT 480-520. 522-CRENULATED. INCLUSIONS IN SOME PLACES.	537	3.7			
				541	9.6			
				551	8.0			
560				559				
	QUARTZ BIOTITE CHLORITE SCHIST		DISSEMINATED PYRITE ALONG FRACTURES IN QUARTZ VEINS 563-567- CRENULATIONS.	563.5	8.7			
					16.9			
				586	10.0			
				596	5.0			
600			FOLIATION:- 65° INCLUSIONS. DISSEMINATED PYRITE.	601	10.6			
	QUARTZ BIOTITE CHLORITE SCHIST. 627.6-634.5. 10E PORPHYRITIC DIORITE.	627.6 634.5	INTRUSIVE CONTACT. COARSE HORNBLENDE & BIOTITE IN FINE MATRIX.	611.6	9.4			
				621	9.6			
				631	3.0			
640				634	10.0			
	QUARTZ BIOTITE CHLORITE SCHIST		FOLIATION:- 68° SEGGREGATED BANDS OF BIOTITE CHLORITE IMPART A BANDED APPEARANCE TO THE CORE. PYRITE FILLING FRACTURES AND CAVITIES.	644	10.0			
				654	10.0			
				664	10.0			
				674	5.0			
680				679				
	QUARTZ BIOTITE CHLORITE SCHIST. 707-801 — QUARTZ CHLORITE BIOTITE SCHIST.	707	PYRITE ALSO OCCURS AS DISSEMINATED AND AS STRINGERS. GRADATIONAL CONTACT. FOLIATION:- 73°	685	6.0			
				690	5.0			
				704	12.6			
				714	9.6			
720					10.6			
	QUARTZ CHLORITE BIOTITE SCHIST		SEGGREGATED BANDS. QUARTZ VEINS CONFIRMABLE WITH SCHIST AT SEVERAL PLACES. FRACTURES FILLED WITH PYRITE.	724	6.6			
				730.6	8.4			
				739	8.0			
				747	10.0			
760				757				
	QUARTZ CHLORITE BIOTITE SCHIST.		FOLIATION:- 75° SAME AS ABOVE.	767	10.0			
				777	10.0			
				785	8.0			
				795	10.0			
800								

ANVIL MINING CORPORATION LIMITED Whitehorse, Yukon

PROPERTY NAME ...LEE (FLAGSTONE)..... HOLE NO. 57-FLAG II SCALE OF LOG ....1"=40'....

SHEE

800	ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	% Ft. RECOVERY	SAMPLE No.	INTERVAL FROM	INTERVAL TO
	QUARTZ CHLORITE BIOTITE SCHIST.	801'- END OF HOLE.	801	6.6			
840							
880							
920							

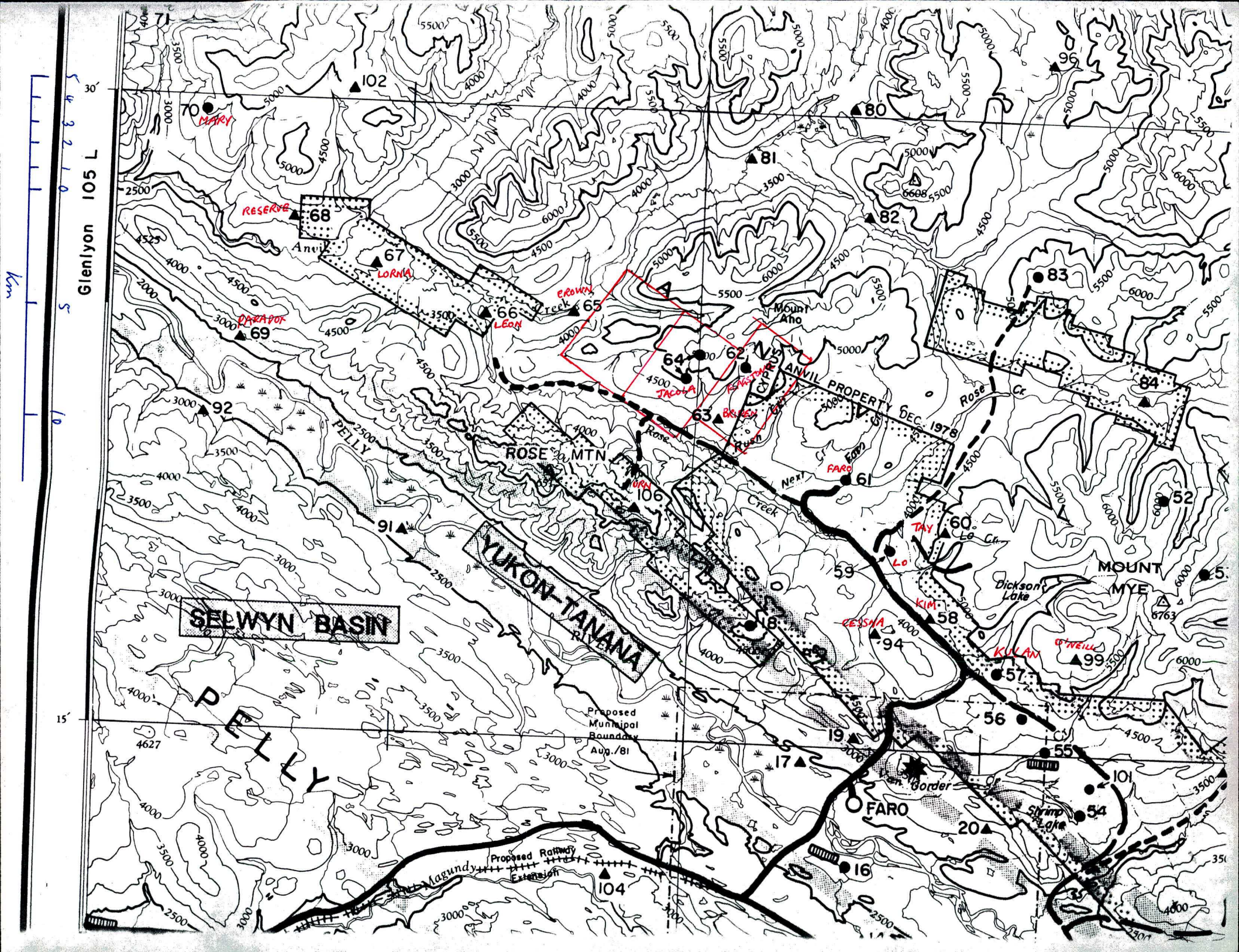
ANVIL MINING CORPORATION LIMITED
Whitehorse, Yukon

PROPERTY NAME Lee (Flagstone Mines Ltd)
LOCATION 27E, 18 + 50 S
DATE DRILLED July 27, 1969-August 10, 1969
SCALE OF LOG 1" → 40' LOGGED BY J. Gondi DATE Aug 12,69

HOLE NO. 69-Lee-1 DEPTH 225 Feet
COLLAR ELEVATION ..... CORE SIZE AQ INCLINATION TESTS
BEARING ..... (MAG OR TRUE DIP -90°
CO-ORDINATES ..... N. ..... E.
SURFACE X OR UNDERGROUND .....
TOTAL RECOVERY 71.5%

SHEET 1 OF 1

ROCK TYPES AND ALTERATION	MINERALIZATION AND STRUCTURES	FOOTAGE BLOCKS	% RECOVERY	SAMPLE No.	INTERVAL FROM	INTERVAL TO
0 0-11'-Over burden 11-52.5'- Banded Quartzitic Phyllite. 3D Increasing in Biotite with depth	Foliation - 72° finely foliated greenish grey Quarzitic Phyllite with interbedded limestone bands. Minor Diopside and					
40 52.5 '- 152'- Quartz Calcite Biotite Chlorite Diopside Schist. 3D	Epidote occurs forming thin bands. Lineations strike roughly at right angles to the coreaxis. Foliation-55° 56.5- 58.5- Diopside and acicular Tremolite.					
80 In places, pronouncedly banded. Thin bands of Limestone occur throughout. In general may be called Skarn.	81'-86' Limestone bands occur 3F extensively. 120'- Pyrite occurs along fractures.					
120 Bands of Meta Greenstone occur at various intervals. 152'-225' Meta Green Stone. Altered to green schist.	3C					
160 Massive green stone occurs in places. Common minerals present are Quartz, Calcite, Dippside and Tremolite. Calcite occurs as Thin Veinlets and bands.	176'-225' massive fine grained greenstone occurs at various intervals. 216' -Chalcopyriteveinlet.					
200 	225'- End of hole.					
240						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YUKON-TANANA
ROSE MTN
Anvil
Mount Aho
ANVIL PROPERTY DEC. 1978
Rose Cr
Next Creek
Dickson Lake
MOUNT MYE
Proposed Municipal Boundary Aug./81
Proposed Railway Extension
Magundy
Yukon Border
Shrimp Lake
FARO
MARY
RESERVE
LORNA
LEON
CROWN
JACOLA
CYPRUS
BRUCE
FARO
TAY
KIM
CESSNA
KULAN
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