

RIO ALGOM EXPLORATION INC.

DIAMOND DRILL LOG

PROPERTY: Gullbridge

HOLE No.: GB-139

Collar Eastings: 115.00

Collar Northings: 2200.00

Collar Elevation: 0.00

Grid: Main

Purpose: Test Gullbridge Mineralized Horizon south of the SW Shaft Occurrence

Collar Inclination: -65.00

~~Collar~~ Bearing: 115.00

Final Depth: 573.33 metres

Logged by: S.Sears/M.H.Lenters

Date: August 19 to 30, 1990

Down-hole Survey: Tropari

FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WIDTH	Cu(ppm)	Pb(ppm)	Zn(ppm)
0	1.93	OVERBURDEN							
1.63	47.47	QUARTZ SERICITIC SCHIST							
		- mottled medium to dark greenish grey with minor reddish-green (hematized) sections; fine to medium-grained - the schist is strongly foliated; the foliation is irregular (wavy) and ranges from 0 to 40° CA with an avg. of ~ 30° CA - dominantly sericite and quartz but contains 10-15% cordierite (overall) and locally 26-30% over widths up to 5-6 m; the cordierite is up to 3 cm in width down to ~ 14 m whereas after 14 m to end the cordierites are generally ≤ 2 cm and avg. ~ 0.5 cm; the cordierite porphyroblasts are hematized and/or chloritized/sericitized and are stretched along the foliation - the unit is strongly sericitized and there is a pervasive weak chlorite alteration; the cordierite porphyroblasts are moderately to strongly hematized; there is a ~ 60 cm strongly hematized zone @ ~ 14:30 m; there the rock is hematized and cut by hematite and quartz veins up to 1-2 mm in width; no cord. porphyroblasts in this section: @ ~ 44.50-44.98 m, is a rhyolite section gradational into the underlying schist suggesting a possible rhyolite protolith for the schist - 3-5% irregular planar quartz veining with veins generally less than 0.5 cm in width; the veins are oriented parallel to perpendicular to the foliation; from approx. 38 m - 41 m is a zone with hairline to 5 mm orange veins (slight effervescence with cool HCl), probably an Fe-carbonate/calcite mixture; they cut both the foliation and the cordierite porphyroblasts - trace pyrite - core is competent with few 10-20 cm fractured sections - lower contact sharp @ ~ 35° to CA (parallel foliation)							
46	46.96	Mafic Dyke							
		- dark gray (green at margins), f.g. with 2-3% pheno-crysts (up to 2 mm); chill margins at both contacts; massive,							

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ca(ppm)
		py : 0.5%								
47.47	51.00	MAFIC (DIABASE) DYKE								
		- dark greenish gray with black margins; f.g. to m.g.; - v.f.g. chill margins over ~ 20-35 cm; massive - the unit consists of 2-3% rounded calcite-filled amygdulose in a matrix of plagioclase and chloritized amphibole or pyroxene; there may be rare Qtz-filled amygdulose - the amygdulose are round to oval and appear unstrained; there are rare feldspar phenocrysts - weak to moderately magnetic - possible pervasive weak chloritization especially within the mafic component of the matrix - few hairline chloritic fractures - weak to mod. magnetism suggests some f.g. dissem. magnetite; 1-2% disseminated pyrite - very competent core - lower contact sharp (intrusive) @ ~ 80° C.								
51.00	106.15	QUARTZ-SERICITE SCHIST								
		- medium grayish green to greenish-gray; generally f.g. with c.g. cordierite - strongly foliated, irregular from subparallel to 40° CA; very wavy and commonly crenulated - composed of sericite and quartz and has ~ 5-15% cordierite (overall) but has 6-7 m sections of 30-35% cordierite; the cordierite is generally ~ 0.5 cm, but can be up to 3-4 cm in width (i.e., around 62 m); the cordierite porphyroblasts are hematized but not as thoroughly as the cordierite in unit from 1.03 - 47.47 m; thin 1-2 cm wide red cherty interval @ 80.55 m; several thin (1-2 cm) discontinuous red cherty bands from ~ 103.50 - 106.15 m - the unit is non-magnetic - moderate to strong pervasive sericite alteration and weak pervasive chloritic alteration - the cordierites are hematized or altered to an assemblage of probable sericite, and chlorite and saunsonite; the last 1.5 m contains 3-4 thin (1-2 cm) interval of discontinuous red chert bands parallel to the foliation - 2-4% Qtz veining, irregular in shape and probably breccinated; ~ 10 cm section of Qtz-flooding @ 93.90 m;								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		at + 78 m, there is a .5-2 cm vein of grey siliceous material, v.f.g. with dark margins - contains black irregular blotches of possible amphibole or pyroxene (possible thin mafic dyke); thin (3 cm) v.f.g. dyke @ 86.80 m - no visible sulphides - core is competent even though it is highly sheared, except for rubbly lower contact - lower contact is sharp and intrusive @ = 25-30° CA; the contact is actually subparallel to CA as within the upper section of the underlying mafic dyke (i.e. 106.07-115.00 m) is a section of rhyolite; core in this zone is very rubbly, partially obscuring the contact; the schist here is extremely foliated within the last 3 metres 53.85 55.45 Mafic Dyke - dark gray to black, f.g. with v.f.g. chill margins; very similar to 47.47-51.80 m except that this section lacks the rounded carbonate filled amygdules, but this unit has a moderate pervasive carbonate alteration - 1-2% f.g. disseminated pyrite - both contacts are sharp and irregular at shallow angles to CA								
106.15	115.00	MAFIC (DIABASE) DYKE								
		- dark green to dark gray-green; f.g.; massive - contains 1-3% small (1-1 mm) ovoid calcite filled spots; these spots are less abundant near both contacts - the dyke is moderately magnetic - the unit is moderately to strongly pervasively carbonate (calcite) altered - few thin (1-0.5 mm) carbonate veins/cuts cutting the unit - no visible sulphides - the dyke is very competent (no rubbly core) - lower contact is sharp and subparallel to the core axis; well developed lower chill margin								
115.00	128.68	RHYOLITE AND SHEAR FOLIATED RHYOLITE								
		- grayish to greenish brown, f.g., massive to foliated with sections foliated @ = 35° CA (i.e., qtz-ser schist sections) - the unit contains up to locally 5% small (1-0.5 mm) f.x								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		phenocrysts and 15-20% (locally) qtz eye phenocrysts up to 0.3 cm in width - the rhyolite and schist are non-magnetic - the rhyolite is weakly sericitized whereas the more foliated sections are moderately to strongly sericitized - a possible weak chlorite alteration. - 10-15% irregular and planar quartz veining; some veins contain a brownish material (possibly a mixture of epidote and sericite); - minor epidote veining (hairline to .5 mm in width) - no visible sulphides within the unit but there is minor pyrite along fractures - the core is competent but there are few sections of blocky core over 10-50 cm - lower contact is conformable and gradational over a few cm into schist @ 35° CA 119.36 120.65 Mafic (Diabase) Dyke - dark gray-green, f.g., with 1-2% calcite filled spots: massive; carbonate-altered as in 106.07-115.00 m; the mafic dyke is probably the same as 106.07-115.00 m; few rhyolite sections with dyke chill around them indicates that the dyke/rhyolite contact is subparallel to CA								
120.60	133.23	SHEAR FOLIATED RHYOLITE								
		- light to medium grayish green - f.g. with sporadic porphyroblasts (up to 1 cm) of cordierite; cordierite is generally confined to the upper 3 m and constitutes ~ 10-20% of the rock; there is a thin (0.5 cm) chert band 10 cm below upper contact; it is non-magnetic and is situated parallel to the foliation - strongly foliated @ 30-35° CA; foliation is generally planar but is occasionally wavy - the unit is non-magnetic - composed dominantly of qtz and sericite, with sericite dominating the upper 30 cm; the rest of the unit appears weakly chloritized - the cordierite porphyroblasts are highly sericitized and hematized; they generally have ragged ends and are variably stretched along the foliation - minor irregular qtz-veining cutting dominantly across foliation; veins are hairline to ~ 1.0 mm in width								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- no visible sulphides - very competent core with only a 30 cm section of rubbly core - lower contact is gradational over ~ 5 cm @ ~ 35° CA; small brown, rounded crystals here may be stretched spherulites								
133.23	147.90	RHYOLITE - light to medium brownish gray in the upper section and medium to dark gray lower section - fine-grained with 1-5% rounded qtz and feldspar phenocrysts ~ 0.1 - 2 mm in width - massive to weakly foliated @ 50° CA; locally brecciated - non-magnetic - down to ~ 141 m the core is brownish gray in color and appears to be possibly more sericitic than the lower 8 m; the lower 8 m appears slightly fresher up to the contact with the underlying schist; - within the upper 8 m there are a few zones of intense reddish-brown alteration; 2 zones are ~ 20-30 cm wide and appear to be K-spar rich (pinkish color) and have ep and chl on some fractures; these zones may be centered around qtz veins; - at ~ 141 m there is a milky white qtz vein with non-magnetic grayish black metallic mineral - around the vein is a hematized halo within the rhyolite - 3-5% planar qtz veining (hairline to 5 mm) generally cutting at high angles to CA; minor ep + calc + chl along fractures - no visible sulphides - the core is competent with only a few blocky zones 10-20 cm wide - lower contact is sharp but probably gradational over 1-5 cm - contact is @ ~ 25-30° CA								
147.90	152.60	SHEAR FOLIATED RHYOLITE - light to medium grayish green; fine-grained - strongly foliated @ 20-50° CA with ~ 30-35° CA avg.; foliation is wavy and sometimes crenulated; locally banded parallel to the foliation with sericitic layers separated by qtz rich layers - unit is generally composed of qtz and sericite with minor								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	ASSAYS			
						WGT%	Cu(ppm)	Pb(ppm)	Zn(ppm)
		chlorite; few (1-2%) chalky yellow phenocrysts (1.1-.2 cm) possibly altered to phenocrysts; there are local zones (1-10 cm) of strong sericitization parallel to the foliation whereas near the lower contact there are a few thin (1.1-.8 cm) sericitized zones cutting across the foliation; these zones appear to be related to possible qtz veining; along fractures there is quartz with minor chl and calc ± K-spar - non-magnetic except for magnetic band near upper contact - 2-4% quartz veining and 1-2% veinlets (± 0.3 cm) of chl ± carb ± K-spar? - no visible sulphides but within 30 cm of upper contact is a 1-1.5 cm wide magnetite band with few stretched hematized rhyolite? fragments - lower contact is gradational over 5-10 cm @ ± 30° CA							
152.60	162.88	RHYOLITE - purplish with many light gray sections within the last ± 6-7 m - fine-gr. red rock with few % small (1-2 mm) phenocrysts and whitish rounded quartz crystals (2-3%) - non-magnetic - the rhyolite sections are mainly massive whereas the lighter gray slightly schistose sections have a very weak foliation - lightly gray areas have greater sericite alteration; all qtz ± ep veinlets have thin (1-5 mm) reddish alteration halos around the veins (possibly K-spar rich) - overall there is ± 5% quartz ± ep veining, generally planar and cut at high angles to CA although there are examples of veins cutting at low angles to CA - minor pyrite found along fractures - the core is competent with a few sections of rubble and blocky core over 20-30 cm - lower contact is faulted @ ± 50-55° CA							
162.88	173.75	QUARTZ SERICITE SCHIST - light to med. gray-green; fine to medium-grained; strongly foliated from ± 45-65° CA with avg. ± 50° CA; top ± 1.2-1.5 m contains more c.g. and thicker (up to 1-1.5 cm) qtz and sericite bands which may be an indication of a more intensely							

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			ASSAYS							
FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		sheared rock; the rest of the unit is banded but on a much thinner scale (i.e., bands are 1-2 mm scale); none of the foliation and banding is crenulated and folded in a sense possibly indicating that there is a synform down-hole - the unit is dominantly f.g. qtz and sericite with local concentrations of cordierite porphyroblasts up to ~ 10% over length of 50-60 cm; overall, 70% of the rock contains no cordierite; the cordierite appears to be highly sericitized and in some cases slightly chloritized as well - within the strongly foliated zone near the upper contact are some discontinuous or are possibly thin (mm scale) red cherts? or hematized quartz veins? which parallel the foliation - unit is non-magnetic - overall the rock is highly sericitized and probably weakly chloritized, especially the upper more intensely foliated zone - 2-5% irregular qtz veining with veins up to 5-7 cm wide; minor calcite, chlorite along fractures - no visible sulphides - the core is very competent - lower contact is sharp and intrusive with a mafic dyke @ ~ 20° CA								

173.75 186.27 MAFIC (DIABASE) DYKE

- dark gray to black; f.g. down to ~ 180 m and m.g. from there to lower chill margin
- large chill margin at upper contact (~ 6-7 m) but thin (10-15 cm) chill at lower contact; unit is massive
- contains 2-4% rounded, small (≤ 0.2 cm) calcite filled spots
- composed dominantly of amphibole (± pyx) and plagioclase with minor pyrite and calcite; from ~ 150 m - 158.60 m is a section where there is a contact zone between the dyke and a qtz-ner schist; this indicates that the CA is paralleling the dyke/schist contact (this schist is similar to lithologies above and below the dyke and the foliation angle (~ 30-40° CA) is also similar to that above and below the dyke)
- the f.g. section is weakly magnetic whereas the m.g. section is slightly more moderately magnetic
- the unit is moderately to strongly carbonate (calcite) altered with the f.g. section slightly more altered than the m.g. section; the amphiboles appear to be partially chloritized
- 1-2% irregular carbonate + chlorite veining with veins up to 0.5 cm wide

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- 2-3% disseminated pyrite cubes, 1-2 mm in width - the core is extremely competent - lower intrusive contact zone is broken but appears to be at a high angle to CA								
186.27	200.92	QUARTZ SERICITE SCHIST (PELSIC TYP)								
		- light to medium gray to green; fine-grained - foliated and banded with banding defined by sericite-rich layers separated by quartz + sericite ± chl - rich layers (i.e., less sericitic layers); both the foliation and the banding are very consistent @ = 45-50° CA but there is one instance where the foliation is wavy and parallel to CA ± 0.5 m above lower contact; minor crenulation throughout most of unit - unit is non-magnetic - the unit is highly sericitized throughout and there is a weak chloritic alteration; unit is slightly more chloritic in the lower 1/3 of the unit, the last 20-30 cm contains 10-15% rounded, 0.1 - 1 cm partially sheared cordierite porphyroblasts (it appears that they are a possible contact metamorphic effect due to intrusion by the underlying mafic dyke) - ± 5% planar qtz veining; the veins are up to 5 cm in width and generally cut the CA at high angles; few minor thin (± 0.1 cm) sericite-filled fractures - no visible sulphides - core is very competent with no blocky or rubbly sections - lower contact is sharp and irregular @ = 20° CA								
200.92	207.50	MAFIC (DIABASE) DYKE								
		- dark gray to black with very weak salt and pepper texture in the more m.g. centre and lower section; chill margins are well developed and f.g.; massive - the dyke has 1-2% small (> 0.2 cm) rounded calcite-filled spots and ± 1% rounded quartz crystals; there is a small xenolith of a c.g. rock @ 206.60 m - appears to be a slightly re-sorbed xenolith of c.g. quartz and amphibole or pyroxene ± feldspar - there is a weak to moderate pervasive carbonate alteration within the dyke; there is also a possible weak, pervasive chlorite alteration - few thin (hairline to 1 mm) calcite and chlorite veinlets								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE NO.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- 1-3% disseminated pyrite - very competent core - lower contact is chilled over ~ 20 cm and it cuts the CA @ ~ 35° CA; a thin v.f.g. dykelet extends into the underlying schist								
207.50	210.36	QUARTZ SERICITE SCHIST								
		- light to medium gray-green; fine-grained; strongly foliated - foliation is generally ~ 35-40° CA but commonly wavy and crenulated - top half is generally a quartz-sericite schist whereas the lower half is a quartz-sericite schist with minor chlorite; minor biotite along the foliation within the uppermost 15 cm and few thin (≤ 2 mm) hematite veins near the lower contact - the unit is non-magnetic - the lower ~ 1.5 m is weakly to moderately chloritized - ~ 5% quartz veining; generally planar but sometimes irregular - no visible sulphides - core is competent - lower contact is sharp, irregular and intrusive @ ~ 25° CA								
210.36	215.20	MAFIC (DIABASE) DYKE								
		- similar to 200.92 - 207.50 m (probably the same dyke since - drilling down the dyke/schist contact); - dark gray to black; fine to medium-grained (m.g. centre); very fine-grained chill margins; massive - 1-3% small rounded calcite filled spots (≤ 1 mm) and ~ 1% larger rounded quartz? crystals up to 2-4 mm in width; few c.g. possibly gabbroic inclusions - the dyke is weakly to moderately magnetic - there is possibly a weak pervasive chlorite alteration affecting the mafic crystals - few minor thin (≤ 1 mm) calcite ± chlorite veinlets - 1-2% disseminated pyrite with 2-3% concentration near thin calcite-chlorite veinlets - very competent core - lower contact is intrusive and sharp ~ 35° CA								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
215.20	230.65	PELSIC CRYSTAL TUFF AND VOLCANICLASTIC								
		- top section down to ~ 218.50 m is med. to dark green, f.g., vaguely banded, and not well foliated; the banding is ~ 30-40° CA but wavy - the middle section up to ~ 223 m is dark gray to greenish gray, f.g. to m.g., less banded and strongly foliated @ ~ 30-40° CA but the foliation is wavy and crenulated (folding possibly suggesting a synform down hole) - down to 230.65 m the unit is medium to dark gray to greenish gray, f.g. to m.g.; strongly banded and foliated from ~ 40-70° CA with average ~ 50-55° CA - the top section is generally a quartz sericite schist containing minor chlorite; the lower part of the top section contains vague crystal (qtz + fs) shapes suggesting the rock is a crystal tuff, the middle section is similar to the top section only there is a slightly greater amount of chlorite - the middle section is a mainly homogenous qtz-fs crystal tuff, generally non-sericitic but slightly chloritized; - the lower section is an unhomogenous, banded section containing biotite ± chl rich layers, gray chert bands and qtz ± chlorite ± sericite bands; this lower section contains some graded bedding sequences suggesting that tops are up hole; the rocks appear to have a strong sedimentary (i.e., reworked) component - the lower section contains ~ 10-15% mafic dykes; the dykes have sharp irregular chilled contacts with the volcaniclastics; the dykes are identical in composition and appearance; most plausible situation is that the dyke/tuff and volcaniclastic contact is being repeated or there are numerous thin dykes intruding along a common zone - the unit is non-magnetic except for a restricted (~ 10 cm) interval around the thin folded red chert bed - overall the unit is weakly altered with the upper section being weakly to moderately sericitized and weakly chloritized; the middle and lower section are weakly chloritized and the lower section contains some biotite rich layers; overall, the primary banding is quite well preserved especially in the middle and lower sections; the lower section contains a few 10-20 cm intervals of 5-20% cordierite spots up to 3-5 mm in width - minor qtz veining (1-2%); veins are generally planar up to 2-3 cm wide and they cut along foliation; few veins are irregular, and some contain traces of pyrite								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- the upper and middle sections contain trace to minor cubic disseminated pyrite; the lower section contains $\pm$ 0.5 - 1% py as disseminations and as concentrations up to 10-15% over widths of 1-5 cm - core is very competent - lower contact with mafic dyke is sharp @ 20-25° CA								
230.65	232.44	MAFIC (DIABASE) DYKE								
		- dark gray; fine-grained with very fine-grained chilled contacts; massive; centre of dyke contains 1-2% very small (up to 1 mm) calcite spots - weakly to moderately magnetic - appears weakly chloritized and is won to weakly carbonate altered - few thin ($\leq$ 1 mm) carbonate veinlets - $\pm$ 0.5% disseminated pyrite - very competent core - lower contact is sharp @ = 35-40° CA								
232.44	240.10	PELSIC CRYSTAL, ASH, AND FINE LAPILLI TUFF WITH GRAY CHERT	200308	232.45	234.45	2.00	32	28	100	860
			200309	234.45	236.60	2.15	21	44	118	430
			200310	236.60	237.62	1.02	100	384	630	510
			200311	237.70	239.28	1.50	61	54	188	620
		- down to 236.60 m is a crystal tuff, below this is a f.g. ash tuff with minor gray chert and lapilli tuff - dominantly dark gray to black crystal, and lapilli tuff with 2 thin (4 cm, 15 cm) light gray chert layers @ 237.27-237.31 m and 237.63-237.70 m - there is a thin ($\leq$ 0.5 cm) discontinuous red chert layer @ = 235.65 m within a section of pyritic tuff - the unit is well banded with the banding averaging = 40° CA but is as high as 60-65° CA; banding is absent to very vague within the the last = 1 m near the lower contact - the unit is variably magnetic, but generally non to weakly magnetic; the red chert and some chloritic areas are moderately to strongly magnetic - the crystal tuffs (up to 236.60 m) are generally composed of quartz crystals (blue to white) and feldspar crystals in a black chloritic and possibly biotitic matrix; the minor lapilli section has light gray (gray chert?) stretched fragments along with qtz and feldspar crystals; these foliated areas parallel the local banding								

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						WIDTH	Cu(ppm)	Pb(ppm)	Zn(ppm)
		- the f.g. sections (i.e., ash tuffs) are a mixture of chlorite : biotite, quartz, feldspar - the crystal tuffs to 236.60 m are weakly chloritized and there is a significant amount of biotite within the upper metre - the ash tuffs are moderately chloritized and there is also some minor biotitic layers - 5-10% irregular calcite : qtz veining cutting along and across foliation; 2-3% irregular qtz : calcite veins also cutting against and along foliations; vein widths range from hairline to flooded zones over 15 cm - the crystal tuffs contain 3-5% disseminated to bedded pyrite overall, with small zones of 15-20% py over 5-7 cm (i.e., especially around the thin red cherts); the ash tuffs and gray cherts have 1-2% bedded py - the core is very competent - the lower contact is sharp but difficult to recognize with possible angle $\theta = 15^\circ$ CA							

240.10 255.30 MAFIC (DIABASE) DYKE

- med. to dark green to grayish green; f.g. to f.g.-m.g.; massive
- unit is an apparent mixture of plagioclase and chloritized amphibole or pyroxene; thin 1-2 cm v.f.g. mafic dyke cutting @ 15° CA @ 251.35 m
- the rock is non to weakly magnetic with local moderately magnetic patches; @ 243.60 m there are possible wallrock fragments of felsic tuff
- the unit appears to be weakly pervasively chloritized and possibly silicified
- very difficult to determine if unit is a dyke or flow; it is very homogenous, unfoliated and separates two similar units, suggesting a dyke but it also has very poorly developed chill margins and contains minor carb : epidote veining suggesting a flow, evidence points more toward a dyke
- ~ 5% planar to irregular carb : qtz veins cutting the unit; veins range in size from 1 mm to 5-7 cm; occasionally minor epidote associated with these veins
- pyrite : pyrrhotite : 0.5% as disseminations within the unit and as minor amounts along fractures
- very competent core
- lower contact with tuffs is sharp @ $\theta = 10-15^\circ$ CA but there is no strong visible chill margins formed in the dyke as with

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							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		previous dykes in this hole.								
255.30	267.05	PELSIC CRYSTAL AND ASH TUFFS WITH MINOR GRAY CHERT	200312	255.44	257.44	2.00	2	TRACE	186	700
		- crystal tuffs section is light to medium gray with whitish salt & pepper appearance due to large concentration of whitish crystals; the ash tuff is medium to dark green and the thin chert is light gray - the crystal tuff (up to = 263.27 m) contains = 40-50% small (up to 2 mm) crystal fragments in a f.g. grayish felsic matrix; of the total crystals, = 70-80% are whitish to slightly pink feldspar crystals and the rest are rounded whitish to blue quartz crystals; within this section is a few discontinuous band of thin (1-2 cm) red chert @ = 255.90 m; the bands are strongly magnetic and are at = 15-20° CA; - the ash section contains up to 5-10% crystal fragments (locally) in a matrix made up dominantly of chlorite, quartz & biotite; the ash section also contains bands of biotite and chlorite; there is a strongly sericitized interval within this section which covers = 50 cm from 265.45 - 265.95 m; two thin gray chert interval within the ash tuff @ 262.48 - 262.55 m and 262.86 - 262.95 m; contacts between the cherts and the tuff are @ = 40-50° CA - the crystal tuffs are massive but sections within the ash tuff are strongly foliated, especially near the lower contact; the foliation and banding are @ 30-40° CA and the foliation and banding are sometimes crenulated - the crystal tuffs are non-magnetic except for immediately around the red chert band where the rock is strongly magnetic; the ash tuffs and gray chert are non-magnetic - the crystal tuffs are weakly chloritized, most evident in the f.g. matrix; the ash tuffs are weakly to moderately chloritized; some weak to moderate biotite also (i.e., biotite-rich bands); there is a = 50 cm section (see above) of strongly sericitized ash; the lowest 50 cm of the unit contains mostly chlorite & biotite and is strongly banded - overall there is only minor pyrite with most pyrite occurring in the upper 2.5 - 3 m where there is .5-1% pyrite - core is fairly competent with few blocky sections over 10-20 cm - lower contact is sharp and intrusive @ = 5-10° CA; the strong banding here is crosscut by the underlying dyke.								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
267.05	280.10	MAFIC (DIABASE) DYKE								
		- fine to medium-grained (v.f.g., well developed chill margins); massive - contains locally 2-3% round, ≤ 1 mm calcite spots; overall there is 2-4% feldspar and quartz phenocrysts; the feldspars are up to 0.5 cm long, ovoid to rectangular, and commonly sericitized?; the quartz is smaller (1-2 mm) and rounded; both are set in a f.g. fs + amph or pya matrix; at ≈ 281.70 m there is a possible wallrock fragment caught up in the dyke or it is a local brecciated zone within the dyke; this small section is non-magnetic - the unit is moderately magnetic - the unit is probably weakly chloritized and some feldspar phenocrysts are sericitized - very few thin (1-3 mm) calcite-rich veinlets - 1-2% disseminated pyrite - very competent core - lower contact is sharp and intrusive into the underlying rock @ $\approx 40^\circ$ CA								
280.16	283.14	PELSIC TUFF AND RED CHERT	280313	281.03	282.03	1.00	93	TRACE	70	1410
		- tuff is medium to dark greenish gray to grayish green and the chert is dominantly red with some black bands between the reddish bands - the tuff is f.g. to f.g. - m.g. and the chert is v.f.g. to f.g. with some c.g. pyrite - the tuff interval (280.10 - 280.47 m) above the chert is a crystal tuff with small (1-2 mm) blue quartz eyes and sericitized feldspar crystals in a f.g. greenish possibly chloritized matrix; few thin, stretched red chert fragments in the crystal tuff - crystal tuff is banded at 45° CA and folded, possibly indicates a synform down hole - the red chert (280.47-280.95 m) is strongly banded with the banding stretched and discontinuous; banding @ $\approx 0-20^\circ$ CA (actual thickness of the chert is probably 10 cm or less); upper section of chert contains c.g. buckshot pyrite whereas lower in the unit is more f.g. disseminated pyrite and few a pyritic stringers; black bands in the chert are hard, magnetic, and								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		appear to be mixture of magnetite and chlorite(?) - below the chert to the lower contact (280.95 - 281.14 m) is an ash tuff to fine lapilli tuff with few fragments, 1-2 cm long and 1-2 mm wide stretched parallel to the banding; the banding is contorted and folded but more planar sections have a banding @ = 40° CA; 4-5 mm folded red chert band @ = 281.25 m; the lower = 10 cm is an intrusive breccia zone with tuff fragments in a hard, silicified matrix (chilled dyke material?); - tuff units are non-magnetic whereas the red chert units are weakly (red bands) to strongly (dark bands) magnetic - the whole unit appears weakly to moderately chloritized with minor sericitization within the tuffs - few irregular qtz veins (= 5%) in the thin uppermost crystal tuff whereas the lower tuff has = 15% qtz-veining; veins are irregular, and are up to 2-3 cm wide; some contain a few wall-rock fragments - py is more concentrated within the chert where there is = 2-4% overall but = 5-10% in upper 10 cm of the chert; the tuff contains minor to locally = 0.5% disseminated pyrite - core is very competent - lower contact is sharp and intrusive @ 15-20° CA; possible intrusive breccia zone (= 10 cm above contact)								
281.14	296.28	MAFIC (DIABASE) DYKES								
		- sequence of 3 mafic dykes - - dyke 1 - 284.55 - 290.59 m - dyke 2 - 283.14 - 284.55 m, 290.59 - 293.67 m - dyke 3 - 293.67 - 296.28 m - it appears that dyke 1 intrudes dyke 2, and dyke 3 possibly intrudes along the lower chill margin of dyke 2 and the upper contact of the underlying felsic tuffs and cherts - all dykes are medium to dark green to grayish green along chill margins; the dykes are f.g. near the chill margins and medium to coarse-grained away from the margins - the sections contain up to 5-7% lath-shaped feldspar phenocrysts in a feldspar-amph + quartz matrix; (possible few fs glomerocrysts); the phenocrysts are generally 2-3mm wide but can be up to 7-8 mm wide; up to few % (locally) .5-3 mm calcite spots - all dykes are of uniform, weak to moderate magnetism - the dykes are weakly chloritized and silicified; the feldspar phenocrysts are partially sericitized and possibly slightly								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		chloritized - minor to 0.5% hairline to 1 mm planar calcite ± chl and epidote veinlets which cut the CA at variable angles - minor to 0.5% disseminated pyrite with possible trace pyrrhotite; present as cubic to rounded crystals up to 3-4 mm wide - very competent core - lower contact is sharp and intrusive @ ± 20-25° CA								
296.28	306.02	FELSIC TUFF AND RED CHERT								
		- interlayered sequence of chloritic ash tuff, red cherts, crystal tuff and ash tuffs gradational into quartz sericite schists near the lower contact; - the ash tuffs are dark green, f.g., with variable amounts (0-locally 25%) cordierite spots - cherts are reddish, f.g. and occurs as concentrations of numerous thin (1 cm) bands, separated by similar thickness dark green chloritic bands; banding ranges from ± 5° CA to 25° CA and is commonly distended or discontinuous (i.e., boudinaged or stretched appearance); some red chert bands are crenulated along chloritic fractures - the crystal tuff (300.95 - 301.52 m) is light to medium green; f.g. with 5-15%, 1-2 mm size feldspar and quartz phenocrysts; bedding within the tuff is ± 15-20° CA - the lower section of ash tuff to qtz-ser schist is mottled gray to green, f.g. and banded; bands consist of alternating chlorite-rich and sericite rich bands each containing quartz, overprinted by 5-10% (locally) variably sericitized and chloritized cordierite spots; the upper part of the lower section contains sericitized cordierites whereas the lower part contains more chloritized cordierite spots - the banding and foliation are planar to wavy and crenulated; more planar sections are @ ± 30° CA - the unit is generally non-magnetic except for the red cherts and the rock immediately next to the cherts - overall the rock is variably chloritized from weak (in the crystal tuff) to moderate within the ash tuff; the lower schistose section is moderately sericitized; locally 10-20% cordierite spots which are variably sericitized or chloritized; the lower section also contains biotite-rich layers - 5-15% irregular quartz veins up to 2-4 cm in width which cut the CA at a large range of angles								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- very minor disseminated pyrite and minor pyrite along fractures - core is very competent - lower contact is sharp and intrusive @ 20-25' CA								
306.02	307.70	MAFIC (DIABASE) DYKE								
		- dark green, f.g. to m.g., massive with chill margin at both contacts - contains ~ 1% rounded quartz phenocrysts and ~ 1% (near upper contact) small (≤ 1 mm) rounded calcite spots all in a f.g. to m.g. fs ± amph (pyroxene) matrix - the rock is moderately to strongly magnetic - the unit may be slightly chloritized; few hairline calcite veinlets - ~ 1-3% disseminated pyrite and probably few f.g. disseminated magnetite due to moderate magnetism - the core is very competent - lower contacts is sharp and intrusive @ 0-10' CA with thin underlying cordierite spotted felsic tuff								
307.70	322.70	CHLORITIC FELSIC METAVOLCANIC								
		- med. to dark grayish green to green; f.g., massive to moderately foliation @ 30-50° CA with avg. ~ 40-50° CA; - weakly to moderately magnetic - the unit as a whole appears to be moderately chloritized; - 1-2% planar to irregular calcite ± qt-ep veins up to 2-3 cm in width - the top 50 cm of this unit is a strongly cordierite spotted felsic crystal tuff whose margins are at shallow angles to CA (top 0-10°, bottom 25° CA); the foliation within the tuff is wavy and ranges from 5-30° CA - there is minor pyrite, generally ≤ 0.5% to trace amounts; moderate magnetism suggests some disseminated f.g. magnetite or pyrrhotite - very competent core - lower contact is vague								
322.70	347.55	MAFIC METAVOLCANIC (ROBERTS ARM DYKE)								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Co(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- light to dark green, f.g. to m.g., massive, no chill margins - non to locally weakly magnetic - the unit is weakly chloritic - 3-7% planar to irregular calcite ± qtz-ep veins up to 2-3 cm wide - minor disseminated pyrite generally ≤ 0.5% - very competent core - lower contact is sharp but not visible due to rubbly core over ± 2-4 cm; fracture pattern suggests a contact @ 65-70° CA								
347.55	360.80	PELSIC TUFF AND RED AND GRAY CHERT	200114	348.00	349.45	1.45	27	6	86	880

- felsic tuff is medium to dark gray to green but mottled with light gray to green ash patches; the tuffs are banded (laminated to bedded) and foliated especially near the lower contact; the banding ranges from 5°-45° CA with avg. ± 30-35° CA; the banding is crenulated in some sections, indicating a synform downhole; the foliation generally parallels the banding but is much more crenulated especially in the lower 5 m; the tuff is non-magnetic except adjacent to magnetic chert horizon

- the reddish cherts (349.50-349.57 m, 350.15-350.24 m, 353.47-354.12 m, 355.60 - 355.70 m) are a dull reddish gray in color, fine-grained and commonly contain chlorite-rich bands; contacts with the host felsic volcanic ranges from 20° - 45° CA; the cherts are non to moderately magnetic

- the gray chert (350.82 - 351.26 m) is medium gray green, f.g. and massive (possible that this is a rhyolite section); contact with banded tuffs is ± 30°-38° CA; the gray chert is non-magnetic

- the foliation within the tuffs is defined mainly by sericite rich layers yet the last 2 m contains appreciable (5-15%) biotite which also defines the variable and wavy foliation

- within the tuff unit (especially the upper half) there are localized areas of cordierite? development over 10-50 cm; the cordierite is up to 1 cm in width but generally ± 3-4 mm; the porphyroblasts are almost completely sericitized and appear to range from underformed to stretched parallel to schistosity; some of the cordierites appear to be hematized (light brownish orange in color) whereas some are completely chloritized (next to some cherty units)

- overall the tuffs are variably sericitized (weak to intense), chloritized (weak to moderate), and there is some biotite

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		alterations within the last ~ 2 m - the reddish cherts are relatively unaltered but the reddish bands within each thin chert package are generally separated by very chloritic bands containing ? magnetite - 3-6% irregular, up to 2-3 cm quartz veins (! carb + chl); these veins generally parallel the foliation (few veins cut across foliation); minor chloritic fractures - pyrite ~ 2-5% within the f.g. (ash) interval within the top ~ 3-4 m section; rest of rock contains only trace pyrite; some f.g. banded? or disseminated pyrite within and near the the reddish chert sections - the core is very competent - lower contact with felsic metavolcanic is gradational over ~ 5-7 cm @ ~ 30° CA								
360.80	381.03	CHLORITIC FELSIC METAVOLCANIC								
		- dark green, f.g., weakly to strongly foliated @ ~ 30-50° CA with avg. 40-45° CA - the weakly to moderately foliated sections are relatively homogenous - stronger foliated sections are chloritic and biotitic - few local brecciated?; zones these zones are often accompanied by epidote-quartz-calcite alteration patches - the unit is strongly magnetic and probably contains 5-10% f.g. disseminated magnetite - the unit is moderately to strongly chloritized; local biotite within the more banded sections - localized 10-20% patches of epidote + calcite + qtz; these patches are more concentrated near the upper and middle section of the unit - up to 5% calcite + qtz veining; they are planar, hairline to 1 cm wide, and generally parallel the foliation although some cut the foliation - 1-3% py disseminated along the foliation and banding within the banded section; the less banded sections contain up to 1% disseminated pyrite along the foliation; ~ 5-10% disseminated magnetite - very competent core - lower contact is possibly gradational into underlying tuff unit; contact partially obscured by veining; contact possibly @ ~ 45° CA								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
383.03	383.75	CHLORITIC FELSIC ASH AND CRYSTAL TUFF								
		- dark green (ash section) to light to medium gray (thin crystal tuff section) - ash section is f.g. and moderately to strongly foliated; the ash tuff contains mainly chlorite and biotite-rich layers with some sericitic layers; the crystal tuff (last 10 cm) contains up to ~ 10% small (1-2 mm) quartz and feldspar crystals in a f.g. siliceous matrix - the foliation within the f.g. ash section is @ 40-50° CA - the unit is non-magnetic - moderate to strong chlorite and biotite alteration within the ash tuff; minor sericite also within the ash tuff; the crystal tuff is weakly chloritic and sericitic, and possibly weakly silicified - few irregular quartz veins up to 1 cm wide - 2-3% f.g. pyrite within the ash tuff but some c.g. pyrite and pyrrhotite at the upper contact; possible trace f.g. sphalerite in the ash tuff (possibly brown oxidized pyrite); 1-3% disseminated pyrite in the crystal tuff - competent core with a rubbly top contact - lower contact is sharp @ ~ 45° CA								
383.75	386.18	CHLORITIC FELSIC METAVOLCANIC								
		- med. to dark green, f.g., moderately foliated @ ~ 30-35° CA whereas the lower ~ 60 cm is banded up to ~ 60° CA - weak to moderately magnetic whereas lower ~ 60 cm is non-magnetic - the whole unit is moderately to strongly chloritic with minor biotite alteration - few irregular qtz veins and minor thin (hairline to 1 mm) calcite veinlets - 2-3% pyrite, disseminated within the banded section; pyrite ~ 0.5% within the non banded section; possible few % dissem. f.g. magnetite accounting for the magnetism within this unit - core is very competent - lower contact is sharp @ ~ 90° CA with underlying crystal tuff; contact partially obscured by qtz veining								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
386.18	401.65	CHLORITIC ASH (FINE LAPILLI) AND CRYSTAL TUFF (QUARTZ-SERICITE-CHLORITE SCHIST) - approximately 80-85% ash tuff (± fine lapilli tuff); the whole unit (ash and crystal tuff) is dark gray-green to black; the unit is fine-grained whereas the crystal tuff sections (i.e., 386.18-386.80 m, 387.60-389.40 m) contains 5-20% blue qtz and feldspar crystals (up to 3-4 mm wide) - the f.g. sections have a strong banded appearance defined by chloritic layers separated by qtz-ser-chl layers; the layering and the foliation are parallel - overall the unit is very chloritic and moderately biotitic; the crystal tuff sections are quartz and feldspar rich with a chloritic and biotitic matrix; possibly a 20 cm section of stretched cordierite crystals @ 394.30 m - the rock is moderately to strongly foliated @ 5-40° CA with an average a 30° CA; the foliation is generally planar but is sometimes wavy - 5-10% irregular quartz veining; veins are up to 1 cm wide, generally follow the foliation and sometimes occur as flooded zones over 10-20 cm; minor calcite associated with the qtz - within the unit is a section containing 0.5-1% sphalerite and up to 4-7% pyrite (i.e., 393.83-394.50 m); the sphalerite is brownish to honey colored and occurs as crystals stretched parallel to the foliation; also f.g. in nature; the sphalerite appears to be associated with quartz bands within the ash tuff; the pyrite is coarser-grained, has a somewhat "buckshot" texture and generally follows the foliation as bands of concentrated pyrite; the pyrite crystals appear relatively underformed; the rest of the unit contains 1-2% disseminated and thin banded pyrite with traces of pyrrhotite - small clots of a 3-5% chalcopryite and pyrite over 10-15 cm at 387.5 m generally associated with qtz rich bands - the core is very competent - lower contact with dyke is sharp and intrusive @ 25-30° CA	200315	386.71	387.71	1.00	308	124	182	390
			200316	391.83	392.83	1.80	86	20	250	270
			200317	392.83	394.50	1.67	128	12	1740	190
			200318	394.50	395.50	1.00	101	16	838	320
401.65	405.27	MAFIC (DIABASE) DYKE - med. to dark gray; f.g. equigranular with v.f.g. chill margins; massive - contains 1-3% feldspar ± quartz phenocrysts up to 3-5 mm								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		vide; possibly some vague qtz phenocrysts (partially assimilated?); there are also chloritized crystals that were probably once amphibole crystals - the unit is very weak to weakly magnetic - the dyke appears to be weakly silicified and the lower 1-1.5 m is weakly to moderately carbonate altered; some weak to moderate chloritization of some previous amphibole? crystals - 1% planar calcite & chlorite veinlets - trace pyrite - competent but somewhat brittle core - lower contact is sharp and intrusive @ ~ 35°C								
405.27	419.45	CHLORITIC PELVIC CRYSTAL, ASH, AND FINE LAPILLI TUFF (QUARTZ-SERICITE-CHLORITE SCHIST)	200319	407.00	408.00	1.00	174	4	4290	170
			200320	414.88	415.08	1.00	64	4	920	160
			200321	415.88	417.60	2.00	449	56	1495	170
			200322	417.88	419.45	1.57	815	TRACE	196	80
		- dark green to gray green, f.g. to locally m.g.; weakly to moderately foliated @ ~ 30-40° CA; the foliation is generally planar but crenulated in some sections - the rock is highly altered which masks the original mineralogy; now the rock is strongly chloritic but there are sections which exhibit crystal fragments (qtz and feldspar) in a chloritic matrix; other section exhibit a m.g. texture of altered crystals in a f.g. chloritic matrix - these may be more altered crystal tuff sections; the more banded sections (30-40° CA) near the lower contact are probably f.g. ash or (fine lapilli) tuffs units - this area is extremely chloritic - the unit is generally non-magnetic except for the last 1-2 m where there is sporadic magnetism - the unit is pervasively moderately to strongly chloritic; the last 6-7 m may be slightly more chloritic than the top 7-8 m; few thin (≤ 1 cm) epidote-bearing zones located around fractures or thin chloritic veinlets - overall ~ 2-4% planar to discontinuous quartz & calcite & chlorite veins up to 5 mm in width - the unit contains up to 3-5% pyrite overall; this can be divided into sections which contain disseminated and ≤ 7-8 mm bands of pyrite (which parallel the foliation) and areas of semi-massive to massive pyrite (e.g. with "buckshot" texture) within the last ~ 3 m of the unit; within the last 3-4 m pyrrhotite also occurs with pyrite (only trace pyrrhotite found in the upper 12-13 m); also within this								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		unit are sections up to 50 cm with < 1-2% sphalerite - the sphalerite is brownish, f.g. and stretched parallel to the foliation; but there may be lighter colored sphalerite near the upper contact (this mineral may be garnet)								
		- trace chalcopryrite found in the lower 3-4 m								
		- core is very competent								
		- lower contact is gradational over ~ 5 cm into underlying unit								
419.45	459.52	QUARTZ-CHLORITE (±MAGNETITE) SCHIST	200323	427.90	428.00	1.00	98	116	250	60
		- dark green with mottled appearance due to numerous black spots; f.g. to m.g. and weakly to strongly shear foliated	200324	432.64	434.64	2.00	1070	6	700	60
		θ = 30-45° CA with avg. = 35° CA	200325	442.65	443.65	1.00	94	TRACE	446	40
		- generally composed of 10-20% (locally higher or lower) 1-3 mm black magnetite crystals in a f.g. chloritic and locally epidote-rich matrix; at ~ 449.80 m there are some quartz filled, round to oval vesicles? over ~ 10 cm	200326	446.03	447.03	1.00	166	92	506	30
		- the unit is very strongly magnetic								
		- the unit is extremely chloritic with almost all shear foliation surfaces exhibiting a dark green to black chloritic luster; there is also 5 to locally 10% epidote ± chlorite alteration "bands" or patches parallel to the foliation (also ± garnet); few epidote alteration zones cut across the foliation; some ep patches also contain bits of wallrock (i.e., ~ 432.30 m); the magnetite is somewhat stretched parallel to the foliation but it also appears to overgrow the fol; (probably the result of a large Fe influx or Fe remobilization during deformation)								
		- few thin (≤ 1 cm) discontinuous quartz veins								
		- magnetite present up to 10-20% whereas pyrrhotite (± pyrite) occur as dissemination and as thin bands (1-5 mm) parallel to the foliation - both occur up to 1-3% overall; traces of chalcopryrite between 433-434 m; ~ trace to 1% sphalerite over 10 cm @ ~ 442.20 m and @ ~ 446.30 m; sphalerite is brown and occurs as wisps parallel to the foliation (as in the above tuffs)								
		- competent core with few 10 cm rubbly zones								
		- lower contact is gradational over ~ 5 cm with underlying crystal tuff; contact appears to be @ a high angle to CA								

459.52 460.80 FELSIC CRYSTAL TUFF

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- mottled medium gray; f.g. to m.g.; bedded and weakly foliated $\theta = 45-50^\circ$ CA; bedding is crenulated in a few sections - unit consists of 30-40% blue quartz eyes and whitish feldspar crystals up to 2-3 mm in width (avg. ≤ 1 mm) in a f.g. gray matrix; the matrix appears to be predominately sericite? and quartz but there is up to 5-7% biotite $\pm$ chlorite helping to define the local foliation; few light brown to green lithic fragments up to 2-3 cm long and 0.5-0.7 cm wide - possibly rhyolite fragments - unit is non-magnetic - unit is quite fresh but may be slightly sericitized and chloritized - few planar qtz veins ≈ 0.5 cm wide - minor disseminated pyrite - competent core - lower contact is gradational into underlying f.g. felsic tuffs								
460.00	468.22	CHLORITIC ASH AND FINE LAPILLI TUFF AND GRAY CHERT	200327	460.82	462.41	1.39	26	40	486	20
			200328	462.41	464.48	2.07	290	TRACE	282	30
			200329	464.48	465.98	1.50	693	8	526	70
			200330	465.98	466.98	1.00	129	14	398	40
			200331	466.98	468.22	1.24	145	14	594	50
		- medium to dark greenish gray tuff and light gray chert; contortedly banded from $0-70^\circ$ CA with the banding commonly crenulated; the more regular banding ranges from $\approx 25-50^\circ$ CA; the banding is commonly defined by pyritic bands; the gray chert occurs from 464.0 - 464.45 m - the rock is very chlorite-rich but there are several light gray siliceous bands (i.e., impure cherts?) which are somewhat gradational into more chloritic layers; the gray chert is very siliceous with minor chlorite and $\approx 15-20\%$ pyrite (as bands up to 70° CA) - the unit is variably weakly to moderately magnetic - the unit is moderately to strongly chloritized; there are few ep $\pm$ garnet patches within the 1.5-2 m above the lower contact; $\approx 50-60$ cm section below the gray chert is weakly sericitized - 3-5% planar to irregular quartz veining with veins up to 1-2 cm wide - overall $\approx 6-8\%$ pyrite occurring as thin (1-1 cm) bands at $0-70^\circ$ CA; the gray chert has $\approx 15-20\%$ pyrite; pyrrhotite is less abundant than pyrite and can occur as thin bands - overall $\approx 0.5-1\%$; trace sphalerite $\theta = 465.55$ m - the sphalerite occurs in a qtz and py veinlet; minor sphalerite θ lower contact								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- core is very competent - lower contact is vague and possibly gradational into underlying mafic metavolcanic flow; possibly a brecciated contact								
468.22	473.13	INTERBEDDED MAFIC METAVOLCANIC FLOWS AND INTERFLOW SEDIMENTS	200332	470.15	470.65	0.50	538	18	230	40
			200331	472.04	473.04	1.00	1695	TRACE	248	40
		- mixed zone of dark green mafic volcanic rock and dark gray to black banded interflow sedimentary tuffs and gray chert - there are 2 intervals of each mafic flow and sediments with each section comprising ~ 1/3 of the total unit - mafic flow 468.22 - 469.70 m 470.78 - 471.70 m - sediments 469.70 - 470.78 m 471.70 - 473.13 m (gray chert from 471.82-472.04 m) - the sediments are black and banded @ 0-45° CA; the gray chert is pyritic (~ 10%) with contacts @ ~ 30-45° CA - the units are chloritic with the sediments being more chloritic than the flows; contains 5-7% epidote ± garnet, calcite patches and veins - the flows contain only minor disseminated and thin banded pyrite and pyrrhotite (sl); local concentration of chalcopyrite (2-5%) near a semi-massive mt + po patch below the gray chert; the sediments contain up to 10% pyrite + pyrrhotite and some magnetite patches (i.e., at contacts of gray chert), the sulphides occur as bands generally paralleling the orientation of the chert contacts (i.e., represent bedding orientation) - core is moderately competent with some chloritic fractured zones - lower contact is gradational into the underlying mafic meta-volcanic								
473.13	491.11	MAFIC METAVOLCANIC FLOW								
		- medium to dark green with minor dark gray to black sections (a major section occurs from ~ 486.25 to 487.92 m - probably represents interflow sedimentary rocks - the mafic flows are f.g. and weakly and variably foliated @ 20-60° CA with avg. ~ 40° CA; the sediments are f.g. to v.f.g. and are apparently gradational into the banded mafic rocks								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- the unit is variably altered from weak to moderate chlorite alteration (flows) to strongly chloritized (sedimentary sections); the flows also contain 5-15% epidote + calcite and garnet patches and bands generally paralleling the local foliation - both the flows and sediments range from non-to moderately magnetic with most of the unit being non-to weakly magnetic - 1-2% calcite + quartz veins, irregular to planar, up to 1-2 cm wide, and generally cut parallel to the foliation - pyrite + pyrrhotite $\leq$ 0.5-1% generally as f.g. disseminations but there are a few of bands up to 5 mm wide - the core is fairly competent with a few fractured zones 10-40 cm wide - the lower contact is abrupt but pseudo-gradational into the underlying schist package; contact @ = 45° CA								
491.11	498.39	QUARTZ SERICITE (+ BIOTITE, CHLORITE) SCHIST (CRYSTAL TOPF)								
		- mottled dark gray-green to purplish gray; fine-grained; strongly foliated @ 50-60° CA and crenulated and folded suggesting a synform down-hole (possible thin (40-50 cm) mafic dyke or flow @ 497.40 m) - the top 2.5 m are less foliated (moderately foliated) and very chloritic; the rest = 1 m is sericitic and biotitic whereas the remainder of the unit is strongly chloritic, biotitic, and contains significant banded, carbonate alteration; it appears that little primary mineralogy remains but within the sericitic section there may be remnant quartz crystals suggesting a felsic protolith - the unit is non-magnetic - along with the strong chlorite, sericite, biotite and carbonate alteration, there are a few epidote + calcite patches and veins - minor to $\leq$ 1% disseminated pyrite - very competent core - lower contact is sharp but possibly gradational into the underlying mafic rock								
498.39	499.35	MAFIC METAVOLCANIC								
		- dark gray green, f.g., massive to weakly foliated @ = 60° CA; contains 2-5%, up to 1 mm, magnetite crystals and few %								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		chloritic spots (altered hornblende), in a f.g. silicified and chloritic matrix - weak to moderately magnetic - the rock appears to be variably (weak to moderate) silicified and chloritized; few epidote + calc patches - few planar quartz and calcite veins up to 0.5-1 cm wide - minor disseminated pyrrhotite and pyrite - contact is sharp @ = 55°-60° CA								
499.35	503.15	PELSIC CRYSTAL AND LAPILLI TUFF								
		- medium to dark gray to greenish gray; weakly to strongly foliated (i.e., locally schistose) @ = 55°-60° CA - much of unit contains vague crystal shapes but sections contain visible blueish to white quartz and whitish feldspar crystals in a f.g. gray matrix; few visible lapilli (gray chert) fragments throughout unit (i.e., green chert fragment near lower contact - = 5 cm long, 1 cm wide) - the unit is non-magnetic - the unit contains a few areas of intense shearing; biotite and epidote (garnet) developed along the schistosity over = 10 cm intervals (e.g. 501.75 m, at the lower contact, and near the upper contact); overall the rock appears weakly sericitized and probably weakly to moderately silicified - cut by 5-7% thin (1 cm) planar quartz veins - up to 1% disseminated and stringer pyrite; stringers are hairline and parallel the foliation - very competent core - lower contact @ = 25°-30° CA is sharp and altered (i.e., biotite and ep alteration); possible breccia (flow top of underlying unit)								
503.15	503.95	MAFIC METAVOLCANIC FLOW								
		- dark green, f.g.; weak contorted foliation - very similar to 498.39-499.35 m - minor ep + calc alteration; top = 30-40 cm is a mixture of thin dykes and flow material; the very top 10 cm is a silicified and epidotized, brecciated section possibly representing a flow top (possible that this is actually an altered and brecciated gray-green chert) - flow is weakly to locally moderately magnetic but the dykes								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		are non-magnetic - trace to minor pyrite - lower contact is sharp @ = 60° CA								
503.95	505.45	PLSIC CRYSTAL TUFF AND FINE LAPILLI TUFF								
		- medium to dark gray; f.g. to m.g. quartz and feldspar crystals and some light green, 1-4 mm wide, lithic fragments - unit is weakly to moderately foliated @ = 50-55° CA - local patches of intense epidote or biotite alteration (over 3-5 cm); unit as a whole is probably weakly sericitized and silicified; - 5-10% planar quartz veining, the veins are up to 2 cm wide; and concentrated mostly within the upper 70-80 cm - 2-3% fine disseminated pyrite - very competent core - lower contact is sharp with underlying mafic rock @ = 50-55° CA								
505.45	506.26	MAFIC METAVOLCANIC (DYKE)								
		- dark green, f.g., massive to very weakly foliated; - has an amygduloidal? top with the amygdules ranging in size from 1 mm to 1.5 cm; infilled with quartz and minor calcite (the larger amygdules may be fragments?) - unit is non-magnetic - the rock is weakly chloritized - trace to minor disseminated pyrite - competent core - lower contact sharp @ = 60° CA								
506.26	508.71	CRYSTAL TUFF AND MINOR ASH AND FINE LAPILLI TUFF	200334	506.63	508.12	1.49	69	6	146	380
		- medium to dark gray; f.g. to m.g. with a f.g. laminated ash and fine tuff section (507.12-507.40 m) (possible banded, impure chert horizon) which is light to dark greenish gray - the ash is banded @ = 70° CA whereas the crystal tuff is more vaguely banded @ 70° CA and also foliated, with the foliation being crenulated								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		- the unit is weakly to moderately sericitized and weakly chloritized; the thin ash unit is weakly chloritized and also locally moderately epidotized (+ some carbonate alteration) - minor (s 1%) thin (= s 5 mm) planar quartz veining - 1-2% disseminated and stringer pyrite cutting the crystal tuff; the ash unit contains ~ 5% pyrite and pyrrhotite as bands; the pyritic bands contain f.g. to m.g. pyrite - competent core - lower contact is sharp @ ~ 60° CA; thin discontinuous gray chert @ the contact								
508.71	529.88	MAFIC METAVOLCANIC FLOWS AND INTERFLOW SEDIMENTS	280335	518.42	519.82	1.41	83	10	196	50

- complex zone of mafic flow and interflow sedimentary units; there are several interflow sedimentary layers which are generally gradational into the banding flows; few of the larger sedimentary intervals include: 509.44-510.48 m and 517.59-519.84 m

- the flows are dark green, f.g. (occasionally v.f.g. to m.g.) and weakly foliated @ ~ 50° CA; amygduloidal @ the upper contact; the amygdules are infilled by a combination of epidote ± chl, qtz

- the interflow sediments are generally f.g., banded and contain cherty sections; the banding is @ ~ 50-60° CA but is commonly contorted and broken and locally brecciated; few thin crystal tuff intervals within the larger sedimentary sections

- overall, the flows are weakly chloritized and weakly to moderately silicified; up to ~ 5% epidote ± garnet and calcite veins and patches; the lower ~ 1 m is more chloritic and altered; the lowermost 30 cm is epidotized and brecciated; the interflow sediments are chloritized but not as silicified as the flows; minor epidote + calcite alteration within the sediments (generally in the brecciated section)

- top half of the unit contains 5-10% planar calcite ± qtz veins up to 1-2 cm wide; the lower half contains only 1-2% veining

- the flow is variably magnetic from non-magnetic to moderately magnetic; strongly magnetic in areas where there is f.g. disseminated magnetite

- the interflow sediments are also non-magnetic to intensely magnetic where magnetite bands occur

- the flow contains minor to locally 1-2% disseminated pyrite and a few bands or stringers of pyrite; also some f.g. dissem-

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		inated magnetite; - the interflow sediments overall contain 2-3% pyrite generally as 1-3 mm bands; local 1-3 mm wide bands of magnetite also occur in the sedimentary intervals - the core is fairly competent with a few 10-20 cm fractured sections - the lower contact is possibly gradational over ~ 5-10 cm; the contact is brecciated and there are bleached? fragments of the underlying melange in the brecciated zone; possible contact is @ ~ 60° CA - very difficult to determine if the breccia is a flow bottom breccia or a fault breccia - the core is relatively competent so it may be a flow bottom breccia - fault breccia may result in a more brittle, broken contact zone								
529.88	532.62	ARGILLITIC MELANGE								
		- mottled purplish argillite with 15-25%, 2 mm - 3 cm greenish mafic to red felsic fragments (some fragments are partially epidotized and some appear granitic?); many of the fragments are contorted and stretched and folded (i.e., plastically deformed); there are no alteration rims around the fragments to suggest they were intruded into a soft sediment package - the fragments are generally @ angles greater than 45° CA but no consistent angle is apparent - the unit does not appear to be altered but there are minor epidote-rich veinlets cutting the unit - no visible sulphides - competent but soft core - lower contact is a ~ 5 cm fault gouge extending from the melange into the underlying mafic flow; the contact is sharp @ ~ 70° CA; possible few fragments of underlying epidotized rock in the overlying melange								
532.62	539.68	MAFIC METAVOLCANIC FLOW								
		- light to medium grayish green to green, f.g.; the whole flow is moderately to intensely brecciated; local concentration (5-10% over 10 cm) of epidote filled amygdulae; 1-1 feldspar phenocrysts - the uppermost intensely brecciated section (~ 2.5 m) is moderately to strongly epidotized and chloritized and								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		carbonate altered; the top 10 cm is intensely epidotized - thin (10-50 cm) sections of interflow sedimentary material includes minor grayish chert - the unit is non to weakly magnetic - mafic dyke cutting unit from 534.11-535.23 m is f.g., and dark green; the interior contains few % carbonate spots and minor fs phenocrysts (?qtz); margins are slightly brecciated with minor epidote alteration; weakly to moderately magnetic - numerous thin (2-3 mm) carbonate veinlets (! epidote, chlorite) - minor to s 1% disseminated pyrite - core is fairly competent even though it is strongly brecciated - lower contact is sharp @ = 50-55° CA, with underlying dyke; the flow is intensely epidotized as the last 10 cm								
539.68	543.45	MAFIC (DIABASE) DYKE	200336	542.15	543.45	1.30	449	TRACE	80	160
		- medium to dark green, f.g.; massive - very homogenous mixture of f.g. plag and amphibole (pyroxene) with few c.g. pyrite crystals - weak to moderately magnetic - strong epidotized zone @ = 541.83 m centered around a pinkish aplitic felsic vein = 5 cm wide; the dyke is also silicified around the vein; dyke is weakly to moderately silicified from the aplite vein to lower contact; down to = 541.80 m the dyke is weakly chloritized - few thin (hairline to s 1mm) calcite and/or epidote veins cutting the unit - = 1%-2% pyrite as c.g. crystals and f.g. disseminations; trace to minor chalcopryite visible below = 542 m; also near the lower contact are some bluish unknown metallic minerals (probably oxidized Cu sulphides) - very competent core - lower contact sharp @ = 50° CA								
543.34	573.33	ARGILLITIC MELANGE								
		- similar to previous melange (529.88-532.62 m) but this section contains less fragments (only 5-15%) and the fragments are less chaotically shaped and folded; (possible rare cherty fragment and local concentration (5-15%) greenish chloritic fragments);								

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FROM	TO	LITHOLOGICAL DESCRIPTION	SAMPLE No.	FROM	TO	WIDTH	ASSAYS			
							Cu(ppm)	Pb(ppm)	Zn(ppm)	Ba(ppm)
		this unit has a more uniform foliation up to 60-70° CA at top, but planar and variable near the bottom (= 70°-30° CA) - many of the fragments are epidotized; few greenish colored intervals within the unit may be f.g. sedimentary rocks interbedded in the melange or possible fragments within the melange (possibly thin mafic flow rocks?). these green sections appear gradational into the purplish melange so they are probably interbedded - the tops of these greenish units also have some chloritized crystals, (possibly cordierite) - overall, = 3-5% irregular qtz ± calcite veins up to 1-2 cm wide - minor chalcopryite associated with some thin qtz-calcite veins near = 549.20 m - cutting the argillite are mafic dyke(s); the contact between mafic dyke and melange is commonly parallel to CA suggesting that drilling is down the dyke/melange contact; the dykes are f.g. dark green and massive with well developed, thin (few cm) chill margins - dyke intervals: 560.25-562.45 m (upper contact = 5° CA, lower = 20° CA), 562.90-563.10 m (upper contact = 25° CA, lower = 15° CA), 568.56-570.00 m (upper contact 5° CA, lower = 10° CA) center of this dyke has a 20 cm epidotized zone with trace f.g. chalcopryite - very competent but soft core - lower contact not encountered								

573.33 End of Hole

Casing Left in Hole

DOWN-HOLE SURVEY DATA

DEPTH	INCLINATION	BEARING
116.43	-67.00	125.00
223.17	-62.00	128.00
348.17	-62.00	129.00
497.13	-59.00	138.00
573.33	-59.00	138.00

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