

CAMBRIAN ROCKS OF THE DALCOATH ANTICLINORIUM**Abstract****Introduction****The Dalcoath Anticlinorium****Bull Creek Formation****Distribution****Evidence for Age****Stratigraphic Relations****The Quartz-Felspar Porphyry****Agglomerates****Chert Pebbles in Porphyry****Geales Bridge Member****Origin of the Bull Creek Formation****Metamorphic Segregations in the Bull Creek Formation.****Hornblende and Epidote Knots****Veins****Structural Considerations****Summary****Appendix 1: Geological Map of Southern Portion of**

Dalcoath Anticlinorium

Appendix 2: Map of Location of Specimens from Dalcoath

Anticlinorium

Appendix 3: List of Specimens from the Dalcoath Area**Appendix 4: Petrographic Descriptions; G. Everard,**

18/3/57

Appendix 5: Rock Analyses; W. Manson, 20/2/57**Appendix 6: Petrographic Descriptions; G. Everard 18/10/57**

Abstract: The rocks of the Dalcoath Anticlinorium are of Cambrian age, and are designated the Bull Creek Formation. The dominant lithology is a quartz-felspar porphyry, which is probably a pyroclastic rock. The Geales Bridge Member occurs in the middle of the formation, consisting of greywacke, chert and porphyry and about 850' thick. The rocks were sheared in the Devonian, with contemporaneous low grade metamorphism producing metamorphic segregations and secretion veins, in that order.

CAMBRIAN ROCKS OF THE DALCOATH ANTICLINORIUM

Introduction: The aim of this paper is to present a factual account of the 'porphyroids' of the Lorinna Area, defining the present problems.

The Dalcoath Anticlinorium: This is the anticlinal structure defined by Ordovician conglomerate and sandstone, extending from Tin Spur in the north to about 886000 (coords) in the south, in the Lorinna area. The general trend of this structure is E.S.E., but Elliston has mapped minor folds trending S.E., on Olivers Hill. The northern portion of the structure is occupied by the Dalcoath Granite, the southern portion by a sequence of Cambrian porphyroids that are the subject of this paper.

Bull Creek Formation: This is defined as those rocks outcropping in the Forth River between 8859 N. and the Dalcoath Granite at 8888 N. For the most part the lithology is quartz-felspar 'porphyry', to be discussed at length, but bands of chert and greywacke (lutite to conglomerate) occur. The approximate distribution of the greywacke is shown on the accompanying map. The outcrops are thought to represent a single band in the middle of the Bull Creek Formation, which is named the Geales Bridge Greywacke and chert Member, and defined as those rocks outcropping in the vicinity of Geales Bridge (88752/41148).

DOF N	S & A	CG	CC & M	ACIM 5.1
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Distribution: Rocks correlated with the Bull Creek Formation outcrop in the Iris River south of Moira, from Hinman to Bifros Creek; and according to Nixon in the core of an anticline on Mt. Stormont (8875 N., 4005 E.). The quartz-felspar porphyry in the Liama Gorge (885/4215) may belong to this formation. Nixon describes sediments in the Iris River near the mouth of Hinman Creek which may be the Geales Bridge Member.

Evidence for Age: The formation underlies Ordovician conglomerate or sandstone, and where the contact is clearly exposed, as in the Iris River near Hinman Creek (8892/4058) and on Mt. Stormont (8877/4007) it is unquestionably an unconformity. The contacts on the Lorinna Road at the gravel quarry (8862 N.) and Tin Spur are not clear, but are probably unconformities.

The rocks unconformably underlie the Ordovician, and are distinct lithologically from the Precambrian, so are presumably Cambrian.

Stratigraphic Relations: At the moment these are obscure. On general grounds it seems likely the Bull Creek formation underlies the Cethana Group of Elliston, the greywacke conglomerate and chlorite rock of the Mago Gorge (887/445) and the Gog Range (889/4325). These last rocks underlie the quartz keratophyre and argillites of the Beulah-Weegeena area. With respect to the Lorinna Formation, this probably underlies the Bull Creek, but may be equivalent to the Geales Bridge Member.

In the absence of palaeontological evidence, these problems will only be solved by detailed structural and lithostratigraphic mapping.

The Quartz-Felspar Porphyry: The dominant rock type in the Bull Creek Formation is a quartz-felspar porphyry, that herein will be referred to as porphyry. Samples 45J2 to 45J7 are porphyries from the Lorinna Road, described petrologically by G. Everard in his memorandum of 18/3/57.

Briefly, the rocks are medium to fine grained; blue, black, or green in colour, with fragments of glassy quartz and cloudy felspar. The quartz is rounded to euhedral, corroded, and almost invariably cracked. The felspar is euhedral, corroded, with cloudy alteration, identified in 45J2 as orthoclase. The fragments range from 1 to 3 mm. diameter. The matrix consists of chlorite, quartz, and felspar, with hornblende, epidote and iron ore often present. Euhedral zircon occurs in 45J3.

The average composition (six analyses dated 20/2/57) is SiO_2 : 64.03; Al_2O_3 : 14.51; Fe_2O_3 : 1.80; FeO : 4.33; MnO : 0.12; TiO_2 : 0.64; P_2O_5 : 0.18; CaO : 4.96; MgO : 2.70; Na_2O : 0.84; K_2O : 4.15; H_2O : 0.25; H_2O : 10.42.

Note that K_2O/Na_2O = approx. 5/1.

The rocks are not homogeneous, with some portions mainly quartz-felspathic. This variation is visible megascopically, a felspathic phase is prominent at 8873/4122. The content of quartz fragments visible in the field varies from 10 to 90 per cent.

It has been suggested the porphyry is a hybridised rock resulting from admixture of acidic and basic material.

for similar rocks elsewhere incipient granitisation has been used to explain acidic patches in the rock. Evidence will be presented in favour of a sedimentary volcanic origin.

Agglomerates: Agglomerate occurs on the Lorinna Road at 88762/41243, consisting of large angular blocks, up to 6" diameter, of purple and green porphyritic lava in a matrix of porphyry (specimen 45819). A similar phase occurs in the Forth River at 88690 N.

A rock from the Lorinna Road (specimen 4582, described petrologically by G. Everard, 18/10/57) consists of pink pebbles of quartz-felspar porphyry up to 3" diameter, and small pink shreds, in a matrix of porphyry. This is probably an agglomerate. The porphyry matrix is in places almost entirely amphibole, with occasional 1/4" bands of material with fibres orientated perpendicular to the walls of the band. This appears to be an amphibolitic phase of the porphyry containing pebbles of pink lava.

In view of discussion to follow on metamorphism of these rocks, it is pointed out that in these agglomerates the pebbles do not have reaction rims.

Chert Pebbles in Porphyry: Chert pebbles and boulders occur sporadically throughout the porphyry- on the Lorinna Road at 88610 N, on the old road at 88780N, in the Forth River at 88700 N (specimen 45810) and at Geales Bridge (specimen 4585). The size varies from 1" to 3" diameter usually, although a greywacke 50 yards north of Geales Bridge contains boulders up to 3' diameter.

Geales Bridge Member: The contact with the Dalcoath Granite is not well exposed in the river, although it can be located within several feet. The rocks within 100' south of the contact contain occasional dykes of granitic material, the porphyry being altered to biotite hornfels (specimen 45830). At first bend south (specimen 4583) the rocks are undoubtedly sediments, consisting of bands of greywacke siltstone (volcanic ash ?) and bands containing large quartz crystals about 3 mm. diameter. The sediments continue to 88819/41213, the southern-most (highest) beds being greywacke siltstone with laminations of slightly coarser material, and a hard blue rock that may be chert. Compaction structures found beneath a dropped pebble indicate these beds are right side up.

Beds of chert occur near 88780/41220, with chert pebbles in the neighbouring quartz porphyry. A banded chert is exposed on the old road at 88760/41190.

Just north of Geales Bridge there is a greywacke conglomerate consisting of boulders of chert varying from 1" to 3' diameter in a matrix of greywacke arenite which contains abundant chert fragments.

At Geales Bridge the rock is quartz porphyry containing numerous pebbles of chert ranging in size from 2" down to 1/8". Just south of Geales Bridge at 88751/41150 chert bands occur in the porphyry, showing reaction against intrusive veins of hornblende and epidote. Cherts of probably the same horizon are exposed on the old road at 88730/41170, and on the new road at 41230/88630 (between Sassy Creek and the Gravel Pit).

If all these sediments are the same horizon, as is indicated by preliminary mapping, the probable sequence

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is as follows:

Porphyry (Upper porphyry member of Bull Creek Formation).
 Geales Bridge Member: Greywacke sandstone and conglomerate,
 interbedded with porphyry in places - about 500' thick
 Porphyry, containing chert pebbles
 and fragments in places - about 100' thick.
 Chert, interbedded with porphyry
 at the top and greywacke siltstone at the base - about 250'
 thick.

Porphyry (Lower porphyry member of Bull Creek Formation).

Origin of the Bull Creek Formation: The high potash-soda ratio and petrology of the porphyry indicates an igneous origin. The porphyry contains agglomeratic phases, and chert pebbles in numerous localities. Although the pebbles of lava and chert could perhaps be construed as xenoliths, the Geales Bridge member is certainly an interbedded continuous band. This supports an extrusive rather than an intrusive origin.

The chemical composition, particularly the high silica content, contrasts strongly with the mineralogical composition if the rock is dominantly lava. Further, despite very careful search no evidence of lava flows has been found - no vesicles or pillow structure, while at the same time there is no field evidence, such as discontinuities, against a common origin for all the porphyry of this district. At Geales Bridge the porphyry contains chert pebbles and grades upward into greywacke, and at 88855/41180 (specimen 4583) there are thin bands of quartz-rich porphyry interbedded with laminated greywacke siltstone. All these considerations taken together imply very strongly that the porphyry lithology in this formation has a common origin which is sedimentary.

Metamorphic Segregations in the Bull Creek Formation: Numerous patches of quartz-porphyry, of high hornblende content and surrounded by white reaction rims occur in the porphyry, notably at Geales Bridge (specimen 4584), on the Lorinna Road near 88762N (specimen 45815) and in the Forth River near 88690N. Significantly, these have been found in greywacke about 50 yards north of Beales Bridge.

The segregations average 2" - 3" long, and are ellipsoidal in shape with the long and intermediate axes in the plane of schistosity. At Geales Bridge the segregations are green, with a white border, in brown porphyry country rock.

The petrology of the segregations is described by G. Everard (18/10/57). The enclosing porphyry is quartz-felspar porphyry, with quartz and feldspar crystals in a fine grained quartz^o felspathic matrix, with a little epidote and iron ore. The white border is similar, but contains much more epidote, some hornblende, and the matrix is fresher. The segregation is similar, but with abundant hornblende. The boundaries are transitional. In the field the country rock of this occurrence (Geales Bridge) is seen to contain chert pebbles. The schistosity runs through the segregations, which are therefore earlier or the same age as the deformation. The number of quartz crystals visible in the field (10 per cent) is not markedly different between the segregation and country rock.

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It is possible the segregations are in fact derived by sedimentary processes from contemporaneous sediments, i.e. the rock is an intraformational or mud pellet conglomerate. This could explain a difference in mineralogy between 'pellet' and country rock. However, this explanation seems quite inadequate to explain the white border. Further, in one locality near Geales Bridge there occurs a joint oblique to schistosity. Where this intersects the segregation, the segregation is locally elongated in the direction of the joint. This is not due to deformation, and appears to be due to the joint-fracture acting as a locus of alteration, analogous to the way in which joints act as loci of greisenation in granitic rocks (W.S. Pitcher, 1953, 'The Rosses Granitic Ring Complex, County Donegal, Eire' Proc. Geol. Assoc. Vol. 64, Part 3, p.p. 153-182; fig.3, p.161). Another joint in the same locality has narrow elongated segregations along its length.

Hornblende and Epidote Knots: These are abundant in various localities, notably Bull Creek (88773/40960), the new Lorinna Road near 88772N, and in the Forth River near 88700N. They are sometimes associated with the metamorphic segregations mentioned above, and would seem to have a common origin.

The hornblende occurs as large rounded knots up to 12" long, rarely less than 6". Smaller knots, 1" - 2" diameter, are usually epidote. Both hornblende and epidote occur in some knots. The knots are prominent on weathered surfaces.

The country rock is usually porphyry, but knotted greywacke occurs as boulders in the river near Geales Bridge, so that knots must occur in greywacke somewhere upstream, probably in Bull Creek.

The knots appear the same ages or slightly earlier than, the schistosity.

Veins: Veins of hornblende and epidote occur in places, notably in Bull Creek at 88773/40960 (specimen 45813), and on the Lorinna Road between 88726 and 88772 (specimens 45816 -18), and in the Forth River at 88751N at the boundary of sediments and porphyry (specimen 4589).

Specimen 4581 has been examined by G. Everard (18/10/57) who states the vein examined consists of a central portion of hornblende and magnetite, with an outer portion of anhedral feldspar, anhedral to euhedral quartz, and epidote.

The veins crosscut schistosity, and appear to be structurally controlled by shear joints symmetrically related to schistosity. This would date the veins towards the end of the tectonic movement.

The material is resistant, forming crosses on weathered surfaces. On Bull Creek some veins are multiply banded with epidote and hornblende, while some poorly exposed epidote veins may be infilled tension gashes.

The veins often contain a central portion of chalcopyrite, as between 8872N and 8882N on the new road.

Mineral veins of calcite, quartz and chalcopyrite occur at 8872N on the new road, while disseminated pyrite is abundant at 8858-8865N in the Forth River, and just north of Geales Bridge.

Structural Considerations: The dominant feature is a very strong schistosity, which reaches maximum development near the mouth of Hortons Creek and decreases in intensity northwards. Between Hortons Creek and Sassy Creek the deformation is very intense, the rock in places being sericite schist with the schistosity lensing around the quartz crystals. Near 8860N in the Forth River incipient boudinage may be developed.

The schistosity is Taberabberan in age, as the limestone in the Forth River at 8859N shows strong shear folding (specimen 45829) with the shear planes parallel to those in the Cambrian rocks to the north. In drill cores at Cethana, G.E. Hale (pers. comm.) found the schistosity in the Roland Conglomerate. In the Iris River at Hinman Creek the schistosity is difficult to locate in the conglomerate due to the weathered outcrop but is developed in some of the overlying beds. Generally, however the schistosity is poorly developed in the Ordovician quartzites where the accommodation could be made by bedding plane slip.

Drag folds have only been seen in about three places, but have their axial planes in the plane of schistosity. Plunge appears to be extremely variable.

There is an indication that the schistosity fans within the Dalecath Anticlinorium, from dipping 30° north on the south limb to vertical or overturned in the axial portion.

There appear to be several second order folds developed in the Cambrian rocks contained within the Dalecath Anticlinorium, trending obliquely to the major structure. The divergence is somewhat less than 45°. This pattern has been previously established in the Ordovician rocks of Olivers Hill by Elliston, Round Hill by Jennings, and the Gog Range by the writer, but this is the first indication of cognate structures in the Cambrian of this area. The schistosity may be related to the axial planes of these second order folds. The increased intensity south is considered to be due to increasing deformation in the vicinity of the Shepherd and Murphy fault or shear zone which crosses the Forth near Hortons Creek.

Summary: The following synthesis is unproven on many counts but is consistent with data collected so far.

During the Cambrian the basin of deposition deepened northward, with stratigraphic onlap onto the Precambrian craton in the south. In Tynnan and Jukesian time the sediments were folded quite strongly, and completely eroded south of the 5-Mile Rise, so that right angled unconformities were formed with the basal Ordovician at Cethana and the Lorinna gravel pits. The pre-Ordovician folds were probably fairly tight, of small wavelength.

During the Bevonian renewed movement folded the Ordovician rocks into the Dalecath Anticlinorium; the Cambrian was already closely folded so deformed further by axial plane slip with the development of strong

schistosity in the groundmass and granulation of the quartz fragments. A penecontemporaneous metamorphism of the albite-epidote-amphibolite grade resulted in the formation of segregations in regions of lower pressure or in areas controlled by initial differences in composition. As the tectonism decreased, the grade of metamorphism rose, so that segregations of increasing mineralogical contrast to the country rock were formed, with more clearly defined structural control. Thus the 'porphyry' segregations contrast weakly with the country rock but are orientated symmetrically to the schistosity, and were followed by hornblende and epidote knots probably related to tension structures, and then by secretion veins strongly controlled by the finally-developed shear cleavage. Finally with emplacement of the granite alteration of a narrow aureole and intrusion of mineral veins occurred.

Kerry L. Burns.

15th November, 1957

Appendix 3:

List of Specimens from the Dalcoath Area

<u>Number</u>	<u>Co-ordinates</u>		<u>Description</u>
	<u>N</u>	<u>E</u>	
45J2	88726	41215	Porphyry from the new Lorinna Road
45J3	88767	41246	do.
45J4	88773	41260	do.
45J5	88808	41259	do.
45J6	88857	41263	do.
45J7	88881	41270	do.
4581	88772	41245	Hornblende vein in quartz porphyry, Lorinna Road.
4582	88820	41270	Lava pebbles in amphibolite, Lorinna Road.
4583	88855	41180	Greywacke, Forth River.
4584	88752	41148	Segregations in porphyry, Geales Bridge, Forth River.
4585	88752	41148	Chert pebbles in porphyry, Geales Bridge.
4586	88835	41210	Laminated greywacke siltstone, Forth River.
4587	88819	41213	do.
4588	88751	41150	Chert from Forth River.
4589	88751	41150	Chert with hornblende vein, Forth River.
45810	88700	41155	Chert pebble, epidote knot, in porphyry, Forth River.
45811	88675	41160	Porphyry from Forth River.
45812	88658	41140	Sheared porphyry, Forth River.
45813	88773	40960	Epidote-hornblende veins, Bull Creek.
45814	88728	41219	Felspathic phase of porphyry, Lorinna Road.
45815	88795	41260	Segregation, from porphyry, Lorinna Road.
45816	88750	41235	Hornblende-epidote veins in porphyry, Lorinna Road.
45817	88726	41215	do.
45818	88772	41245	Hornblende - Chalcopyrite spots, in porphyry.
45819	88762	41243	Agglomerate, Lorinna Road.
45820	88789	41212	Porphyry, Forth River.
45821	88649	41095	do.
45822	88752	41189	Banded chert, old Lorinna Road.
45823	88773	40960	Porphyry, Bull Creek.
45824	88700	41155	Porphyry, Forth River.
45825	88751	41150	Chert, Forth River.
45826	88922	40575	Porphyry, Iris River.
45827	88650	40350	Porphyry, Iris River
45828	88580	41120	Fossiliferous limestone, Forth River.
45829	88580	41120	Limestone with shear folds, Forth River.
45830	88880	41220	Hornfelsed porphyry, Forth River.

Appendix 4:

The following descriptions apply to rocks collected by Regional Geologist, I. Jennings in areas adjacent to the Lorinna Road, and covered by aerial photographs Mersey Run 5/61/52-57.

Mersey Run 5/61/52 - Quartz-felspar porphyry, Lorinna Road

Medium to finegrained dark green rock. The colour is not quite uniform as there is an occasional patch of paler felspathic material. Visible crystals consist of irregular glassy quartz and white rectangular felspar about 1 mm. across.

In thin section the texture is porphyritic with euhedral or rounded or irregular and corroded quartz crystals, cloudy crystals of felspar, and confused masses of uraltic hornblende in a quartzo-felspathic groundmass, with chlorite and epidote.

The felspars show alteration and may have sericitic inclusions, but simple twinning along 001 and extinction parallel to the twin plane indicate orthoclase. Occasional crystals show fine multiple twinning with low extinction angles. Accessory minerals are ilmenite and magnetite.

53. Quartz-felspar porphyry - Lorinna Road

Finegrained greenish-black rock with glassy phenocrysts of quartz.

In thin section shows rounded and euhedral crystals of quartz, all slightly corroded, and lath-like and irregular remains of hornblende crystals, partly chloritic, and partly altered to iron ore minerals. In between the size of the phenocrysts and the very fine groundmass is much quartz in angular and irregular grains. The groundmass is greenish and seems to consist of chlorite, quartz, epidote and felspar. There are patches of iron ore and euhedral crystals of zircon. Original felspar crystals are absent or exist only as very shadowy and irregular patches.

54. Quartz-felspar porphyry, Lorinna Road

Greenish black rock with phenocrysts of glassy quartz. The groundmass is very finegrained but the rock is not uniform as there are xenoliths of lighter coloured siliceous material which seem to be associated with epidote, and some xenoliths consist almost entirely of epidote.

In thin section the rock shows plastic flow structure. There are lenticular inclusions of quartz-felspathic material containing corroded quartz grains, multiple twinned felspar crystals and aggregates of uraltic hornblende. The very finegrained groundmass seems to consist of chlorite and epidote.

55. Quartz felspar porphyry with pyrite nodules.

Dark greenish rock with phenocrysts of quartz, and large single crystals and coarse grained aggregates of pyrite.

In thin section the rock is seen to consist of

Appendix 4 (cont)

A quartzo-felspathic groundmass, not entirely uniform, some parts being of coarser grain than others, containing patches of epidote and iron ores. The quartz phenocrysts are rounded and peripherally corroded.

56. Quartz porphyry

Medium to fine grained dark greenish rock with glassy phenocrysts of quartz and a trace of sulphides.

In thin section the quartz crystals appear corroded and have inclusions of other minerals. The groundmass is quartzo-felspathic and contains in addition innumerable small granules of epidote. Uralitic hornblende also occurs in confused aggregates. Flow structure is prominent.

57. Porphyry - Lorinna Road

Dark greenish rock with glassy phenocrysts of quartz and fewer cloudy phenocrysts of felspar.

In thin section the texture is porphyritic and glomeroporphyritic, with single crystals of felspar and quartz somewhat corroded, and groups of crystals comprising quartz, felspar, uraltic hornblende, epidote and iron ores. The matrix is very finegrained, consists of quartz, felspar and epidote, and shows plastic flow structure.

From the evidence of the above sections it is apparent that these rocks have a complex origin and a complicated history. Metamorphic textures and structures are plainly shown. However, the minerals present indicate an igneous origin. Such an origin would be indicated by a high ratio of potash relative to soda. A high silica content in such melanocratic rocks is anomalous; but under the microscope evidence appears for a high silica percentage in the groundmass. In addition the rocks in some instances are shown to be far from homogeneous and some portions are mainly quartzo-felspathic. There is evidence that the rocks are hybridised, and composed of a mixture, rather incomplete, of quartz porphyry and doleritic magmas, metamorphosed under conditions of moderate temperatures and pressures.

G. Everard,
Mineralogist and Petrologist
18/3/57

NOTE:

Mersey Run 5/61/52: Specimen	45J2	(88726N/41215E)
	53:	45J3 (88767/41246)
	54:	45J4 (88773/41260)
	55:	45J5 (88808/41259)
	56:	45J6 (88857/41263)
	57:	45J7 (88881/41270)

Appendix 5:

Mr. I.B. Jennings,
Regional Geologist.

CERTIFICATE OF ANALYSIS

The samples of porphyries received from the above on the 21st January, 1957, stated to be from Lorinna District have been examined with the following results:-

Reg.No.	40	41	42	43	44	45
Mersey Run 5/61	52	53	54	55	56	57
SiO ₂	64.14	64.08	65.16	63.20	66.36	63.24
Al ₂ O ₃	14.53	15.37	14.67	14.36	12.57	15.59
Fe ₂ O ₃	1.79	1.07	1.86	3.07	1.47	1.32
FeO	4.11	3.99	3.99	4.50	5.11	4.28
MnO	0.12	0.13	0.08	0.12	0.18	0.08
TiO ₂	0.60	0.75	0.65	0.73	0.57	0.55
P ₂ O ₅	0.16	0.19	0.19	0.20	0.16	0.16
CaO	4.07	4.49	4.74	4.64	6.20	5.60
MgO	2.75	2.75	2.52	2.42	2.85	2.90
Na ₂ O	2.30	0.53	0.48	0.53	0.80	0.39
K ₂ O	3.84	5.45	4.54	3.89	2.72	4.44
H ₂ O ⁻	0.16	0.21	0.22	0.38	0.16	0.15
H ₂ O ⁺	1.39	1.44	1.58	1.87	1.14	1.10

signed W.St.C Kanson
Chief Chemist and Metallurgist

Note Run: 5/61/52: Specimen 45J2 (88726N/41215E)
 53: 45J3 (88767 /41246)
 54: 45J4 (88773 /41260)
 55: 45J5 (88808 /41259)
 56: 45J6 (88857 /41263)
 57: 45J7 (88881 /41270)

Appendix 6:

The following petrographic descriptions apply to rocks collected by Geologist K. Burns.

Lorinna Road - 4581:

Fine grained, dark grey rock with glassy phenocrysts about 1 mm. across. The specimen is cut by a complex vein about $\frac{1}{2}$ " wide, consisting principally of quartz with an irregular centre up to $\frac{1}{4}$ " wide, consisting principally of hornblende needles.

In thin section the rock consists of a fine grained ground mass of quartz-felspathic mosaic with disseminated, minute books of yellowish mica. The ground mass in general has a rather mottled appearance due to palimpsest structure. In this matrix are crystals of quartz and felspar. The quartz is somewhat cracked and distorted and the felspar is corroded. Opaque rounded iron ore minerals are fairly common and there are patches of yellow mica.

The vein boundary is in most places quite sharp, but there are places where minerals from the vein have penetrated into the rock. As stated, the middle of the vein consists of hornblende. The mineral is strongly coloured, intensely pleochroic, and arranged in radial and sheaf like masses of prismatic crystals. Euhedral crystals of magnetite arranged in strings and irregular patches tend to be associated with the hornblende. The outer parts of the vein contain anhedral crystals of felspar up to 0.5 mm. across. Most of the crystals show no twinning, but irregular coarse lamellar twinning is sometimes seen. Granulation that may be due to recrystallisation is also common. Quartz is present in equal or greater quantity. The quartz is mainly in irregular grains, but some euhedral crystals are present. The anhedral quartz contains much included material, including minute drops of liquid with mobile bubbles. Yellowish epidote is common, as small irregular grains and masses.

Lorinna Road - 4582

Dark greenish finegrained rock with subrounded quartz phenocrysts, and irregular patches of pink felspathic material. A large pebble-like inclusion of pinkish felspathic material containing quartz grains also occurs.

The rock is a fine granular quartz-felspathic matrix, containing larger grains (up to 1 mm.) of quartz, altered felspar, irregular granular masses of epidote, and masses of fine acicular hornblende, sometimes altered to chlorite.

The pink area has a matrix of quartz-felspathic material even finer grain, and it shows flow texture. Phenocrysts of corroded quartz grains and semi-opaque felspar crystals are common. Quartz, and quartz and epidote, occur as groups of fine granular crystals in the finer-grained matrix.

Forth River - 4583:

Finegrained dark greyish or brownish rock with indefinite porphyroblastic patches. One part of the specimen is thickly studded with somewhat rounded quartz crystals about 3 mm. across.

The rock is a very fine, even grained aggregate of

Appendix 6: (cont.)

quartz, feldspar, sericite and biotite. Irregular areas consisting mainly of sericite become visible under crossed nicols and may be the ghosts of feldspar crystals. The large quartz crystals show rounding and embayment.

Geales Bridge - 4584:

Dark brownish grey rock with numerous white phenocrysts. It contains a rounded flattened inclusion greenish in colour and surrounded by a white border.

In thin section the rock appears as a sheared quartz-feldspar porphyry with subrounded crystals of clear quartz and rounded rhomboidal crystals of altered feldspar showing simple or no twinning, in a very finegrained quartz-feldspathic matrix. A little epidote, magnetite, and pyrite is present.

The green inclusion consists largely of hornblende and epidote in confused masses of fine crystals, together with phenocrysts of quartz and feldspar and irregular masses of quartz-feldspathic matrix.

The white band is similar to the sheared porphyry but the matrix is fresher and whiter and there is more epidote present. The three different types merge gradually into one another.

(signed) G. Everard
Mineralogist and Petrologist
18/10/57

Note:

Specimen 4581 : Lorinna Road (88772N/41245) is a hornblende vein in the porphyry.

Specimen 4582: Lorinna Road (88820N/41270E) is considered to be a lava (quartz keratophyre) pebble in porphyry.

Specimen 4583: Forth River (88855N/41180E) is within 1000' of the Dalcoath Granite and is interbedded greywacke siltstone and coarse arenite.

Specimen 4584: Geales Bridge, Forth River (88752/41148) is considered to be a segregation in porphyry (pyroclastic, that here contains chert pebbles).