

Western Tasmania Regional Minerals Program
**Ground truthing aeromagnetic
and radiometric features,
northern Tasmania**

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Summary

Radiometric and aeromagnetic features/anomalies in central northern Tasmania were investigated for Mineral Resources Tasmania as part of the Western Tasmanian Regional Minerals Program (WTRMP).

The main focus of the field work was targeting discrepancies and anomalies between the known geology, as compiled by Mineral Resources Tasmania at a scale of 1:250 000, and the results of the radiometric and magnetic surveys undertaken as part of the WTRMP. Radiometric features have been the primary target because source rocks should be locatable by ground traversing (outcrop/subcrop) and potential exists to define alteration associated with mineralisation. The radiometrics in this survey have been very effective in consistently differentiating broad lithological groups regardless of varying vegetation cover and land use. In most cases the feature source could be explained.

Geophysical features targeted for ground 'truthing' were broadly grouped into the following categories:

- coincident radiometric highs and magnetic lows associated with inliers (windows) in Tertiary basalt;
- coincident radiometric highs and magnetic lows defining extensions to mapped Palaeozoic rocks in areas of Tertiary basalt cover;
- magnetic highs associated with the Cambro-Ordovician transition;
- anomalous radiometric/magnetic features associated with pre-Carboniferous rocks;
- radiometric features associated with post-Carboniferous rocks; and
- radiometric differences in Tertiary basalt.

Areas of economic interest generated by the field work and ranked in order of potential include:

- Minnow River/Mt Roland, a coincident magnetic and radiometric anomaly associated with magnetite veining in Cambrian volcanic rocks, may have similarities to the Fire Tower Au prospect located 3.5 km to the ESE;
- west of Companion Hill, magnetic anomalies in areas of Tertiary basalt cover what may be skarns developed in the Gordon Limestone with tin and tungsten potential;
- Two Hummocks, Mount Read Volcanics rhyolite porphyries and associated hydrothermal breccias which may have gold potential;
- Wilmot, Mount Read Volcanics mafic-felsic intrusive rocks with potential for porphyry-style mineralisation; and
- Gads Hill area, southeast extensions of the Bismuth Creek Fault with gold, tin and tungsten potential.

Points of interest in terms of regional geological interpretation generated during the ground truthing include:

- Companion Fault at Hampshire (393 000 mE, 5 424 000 mN);
- southeast extension of the Bismuth Creek Fault and the association with the Dove Granite at Gads Hill;
- Dove Granite, Bond Range Porphyry and the Cambro-Ordovician contact, a coincidental association?
- Beulah granite diapirs/domes, a Cambro-Ordovician event?
- NNW-trending fault, Standard Hill to the Forth River Estuary.

Introduction

This report covers seventeen field days of geological 'ground truthing' of aeromagnetic and radiometric features in northern Tasmania generated by the Commonwealth Government funded WTRMP survey.

Targets for investigation were selected by Dr John Bishop, consulting geophysicist to the project, Dr Marcus McClenaghan (MRT geologist) and the writer, and covered an area between 384 000 mE and 483 000 mE and north of 5 390 000 mN.

The data used in this fieldwork comprised hard copy maps of total magnetic intensity, total count radiometrics and compilation MRT geology at 1:100 000 scale.

Field work was limited to the location/identification/explanation of the geophysical feature. More detailed field investigations and literature searches have not been carried out but recommendations for further work, where considered warranted, have been included at the end of each location description. Data were compiled on 1:250 000 and 1:25 000 scale overlays. Stratigraphic nomenclature of the existing map sheets (Tasmania Department of Mines Geological Atlas 1:63,360/1:50 000 Series) has been followed.

Site descriptions are included in the discussion section and follow the format:

- AMG co-ordinate and location;
- geophysical feature;
- location and access;
- geological description and conclusions.

In each section locations are listed in order of ascending eastings.

Nineteen rock samples were collected (sample numbers 110001-110019), two of which were submitted for thin section and one for XRD. These samples are only a reference collection and should not be assayed, as better samples could be collected with limited additional groundwork and literature search. Many of the samples are composites of several different lithologies from a location.

Structural data in the text follows the convention that the dip is anticlockwise to the strike, i.e. 000.50/dip 50 west. All strikes are true, having been corrected for magnetic declination.

A MicroKappa Kappameter Model KT-5 has been used for magnetic susceptibility measurements. All readings are labelled SI in the text.

In several cases the writer was aware that anomalies had been explored in the past by mining exploration companies and an approximate date is given for when this activity took place. MRT open file company exploration reports have not been researched.

Discussion of results

There is some overlap and repetition in the discussion of the results but the following format was considered the easiest way to deal with numerous, more or less disconnected locality descriptions. In each section points are listed from west to east, regardless of northing.

Inliers ('windows') in Tertiary basalt

Shooters Hill: 389 000 mE; 5 420 500 mN

A weak radiometric high 14 km southwest of Hampshire within Gunn's forestry area. The outcrops are located a few hundred metres west of the Hampshire-Tullah highway.

Several small hills (knobs) of sandstone are capped by quartzose greybilly conglomerate. The sandstone is well sorted, quartzose, micaceous, bedded with frequent nodular float blocks. The lack of strong jointing, foliation or quartz veining would suggest a Permian age, part of the Wynyard Tillite?

Additional traversing in the area and particularly in the Wey River just to the south may locate lower Palaeozoic stratigraphy. A weak radiometric feature 1500 m to the south should also be followed up.

Mundays Hill: 390 500 mE; 5 444 500 mN

A coincident radiometric high and magnetic low 2.5 km southwest of Yolla at the head of Dowlings Creek.

Clayey soils developed on Permian tillite subcrop.

Sago Plain: 390 700 mE; 5 407 500 mN

A discrete but weak radiometric high 25 km SSW of Hampshire within Gunn's forestry area.

Only Tertiary basalt soil and float located. Minor quartz sandstone float in the Hellyer River ~700 m downstream from the anomaly could be sourced from outcrop in the area.

The source of the radiometric response has not been explained.

29 Mile Road: 392 500 mE; 5 424 500 mN

A coincident magnetic low and weak radiometric high nine kilometres southwest of Hampshire in Gunn's forestry concession.

A small exposure of greywacke in a tributary of the Emu River 100 m upstream from the 29 Mile Road. The greywacke is grey, quartzose, hornfelsed and slightly chloritic and lithologically similar to the Precambrian Burnie Quartzite and Slate in the Guide River on Oonah Road.

Additional field work could be carried out to determine the age and structures in the area.

Regardless of whether the greywackes are Precambrian or Cambrian there must be a major north trending fault (east side down) between these outcrops

and the west-dipping Odc of Companion Hill one kilometre to the east (see the St Valentines geological map sheet; Baillie *et al.*, 1986).

Basils Road: 392 700 mE; 5 426 200 mN

Well defined coincident radiometric high and magnetic low seven kilometres southwest of Hampshire in Gunn's forestry concession.

Outcrop of siltstone and greywacke, grey, bedded-laminated and slightly micaceous. Probably the same unit as greywacke on 29 Mile Road (see above) but lacks hornfelsing.

Wey Road: 393 500 mE; 5 420 600 mN

Coincident radiometric high and magnetic low 12 km SSW of Hampshire, between 29 Mile Road and Wey Road within Gunn's forestry area.

A low lying area with Tertiary basalt soil and float with patches of pebble-cobble gravel. The gravel is of mixed provenance including calc-silicate hornfels and quartzose conglomerate. The source of the geophysical feature has not been fully resolved but the gravel is probably sub-basaltic. Pre-Tertiary rocks may be located with more traversing.

St Georges River: 395 500 mE; 5 440 500 mN

Radiometric high ten kilometres NNW of Hampshire on Prospect Road.

Clayey soils on Permian tillite.

African Plain: 395 600 mE; 5 403 400 mN

A very weak radiometric high, the outcrop only located while en route to another location. The site is 28 km south of Hampshire on Painter Road within Gunn's forestry concession.

Quartz sandstone and siltstone, cream-pale green, bedded 095.30 and capped by Tertiary greybilly. Some sandstone is quartz veined which would suggest a pre-Devonian age and most likely Siluro-Devonian.

More extensive mapping is justified to define the stratigraphic position and structure; a stronger radiometric high just to the west suggests the exposure is more extensive.

Rabbit Plain: 397 000 mE; 5 416 000 mN

A coincident radiometric high and magnetic low 15 km south of Hampshire in Gunn's forestry concession on the Blythe Spur 2 logging road.

Bedded to massive sandstone-quartzite with minor siltstone, micaceous and locally carbonaceous, weakly pyritic with limonitic joints. At 396 700 mE; 5 415 850 mN massive pyrite nodules/clasts <40 mm occur in the sandstone (Sample 110012). Brachiopod fossils have been located at 397 250 mE; 5 416 450 mN, probably indicating a Siluro-Devonian age, most likely a Florence Quartzite correlate.

A structural traverse has been carried out along Blythe Spur 2 Road, all strikes and dips are of bedding unless otherwise stated. The following distances are from the Blythe Road junction:

- 1100 m (396 350 mE; 5 416 100 mN), 012.30, Tertiary basalt – sandstone contact
- 1300 m , (396 550 mE; 5 416 050 mN), 040.15
- 1450 m, 052.60
- 1500 m (396 700 mE; 5 415 850 mN) 045.30, sandstone with massive pyrite nodules/clasts
- 1600 m, flat lying
- 1800 m (397 000 mE; 5 416 000 mN) 345.90 foliation
- 2100 m (397 050 mE; 5 416 200 mN) 275.10, limonitic joints 335.90
- 2400 m (397 250 mE; 5 416 450 mN) brachiopod fossils
- 2500 m, flat lying
- 2700 m, 225.20
- 2800 m (397 500 mE; 5 416 650 mN), 120.70, quartzite, possibly NW-trending fault at 2750 m.

These bedding readings indicate broad, open, NNW-trending folds.

Upper Guide Falls: 397 500 mE; 5 435 500 mN

Coincident radiometric high and magnetic low. The extent of the anomaly indicates exposure for 1500 m along the river.

Located four kilometres NNW of Hampshire in the headwaters of the Guide River and accessed by forestry tracks off Oonah Road.

Outcrops are of dark grey, slightly micaceous greywacke and siltstone interbeds (bedding 190.65) with scattered pyrite blebs and moderate hornfelsing. Stream float includes quartz-veined greywacke and pink-grey calcsilicate hornfels with minor pyrrhotite.

The greywacke is similar to that at Basils Road and 29 Mile Road west of Companion Hill (see above).

This area may have been mapped by Comalco in the late 1970's, if not mapping should be completed, the hornfels indicating proximity of granites in the area.

Pet River: 399 000 mE; 5 436 000 mN

Coincident radiometric high and magnetic low 4.5 km NNE of Hampshire in the headwaters of the Pet River.

The site has not been visited as part of this investigation but Cambrian? greywackes with tourmaline and pyrrhotite may outcrop in the area and are associated with tin anomalies. Further detail is available in Comalco Exploration reports (Askins, 1978).

Dempster Creek: 404 000 mE; 5 417 000 mN

Coincident radiometric high and magnetic low, indicating an area 2 km × 0.5 km of inlier 15 km SSE of Hampshire.

Mount Read Volcanics equivalents were mapped by GeoPeko (?) in the late 1970's, but the site has not been visited as part of the current investigation.

Radiometric highs defining extensions to mapped Palaeozoic rocks

Two Hummocks: 399 500 mE; 5 413 600 mN

Radiometric high 17 km SSE of Hampshire in Gunn's forestry concession, 2.75 km along and at the end of the Hummocks Road.

Float and subcrop of MRV felsic volcanic/intrusive rocks, all lithologies may be textural variations of the same lava/intrusive? (see sample 110011) and include:

- brecciated quartz-feldspar porphyry, phenocrysts dominantly pink kspar with some sericite-altered plagioclase?, scattered magnetite grains (0.2–3.0 SI) in a fine-grained groundmass.
- grey-green, moderately chlorite/sericite altered quartz phyric volcanic? rock, abundant limonitic flecks possibly after carbonate?, brecciated?
- hydrothermal breccia developed in porphyritic volcanic? rock, breccia matrix quartz.

The brecciated volcanic/intrusive rock may be associated with the barytes occurrence at the Two Hummocks? The area warrants further field work and a literature search, the breccias may have some gold potential.

Two Hummocks: 400 000 mE; 5 413 600 mN

Radiometric high 1.6 km along and at the end of Wattle Park Spur 3 Road.

Outcrop of fine-grained cream to grey vitric tuff. Slightly hematitic pebble-cobble conglomerate with jasper fragments occurs as large boulders between the vitric tuff and Tertiary basalt which outcrops to the southeast. There are some greybilly blocks but most of the conglomerate looks similar to the Odc; detailed mapping is needed to resolve this.

If Odc is in situ then the Two Hummocks may represent a dome-like structure with the brecciated rhyolite as a core(?). Are there similarities with the interpreted Beulah Diapir?

Nietta: 420 500 mE; 5 417 000 mN

Weak radiometric high over mapped Tertiary basalt and small Om outcrops three kilometres southwest of Nietta and 500 m southwest of Kaydale Lodge in a recently established eucalypt plantation on this property.

Outcrops located at 421 200 mE; 5 417 100 mN and 420 600 mE; 5 417 300 mN are of weakly foliated and slightly hematitic sandstone/wacke. These exposures

have been located on the Wilmot 1:25 000 geological map (McClenaghan and Green, 1999a) and are included with the Moina Sandstone (Om) but the main body of this rock type to the west is not associated with a radiometric response. Why? The radiometric high is most likely associated with the volcanic wacke component in the sandstone and could be upper Cambrian 'Jukes' equivalent, quite a lot of this style of sandstone occurring in the Black Bluff Range area.

Leven River: 423 000 mE; 5 433 000 mN

A mismatch in geological boundaries and radiometrics on the southern edge of the Devonport geological map sheet (Burns, 1963) 12 km southwest of Ulverstone.

On the Sheffield map sheet to the south (Jennings *et al.*, 1959) there has been greater unit differentiation in the MRV accounting for the radiometric feature. These boundaries should be transferred to the 1:250 000 scale geological compilation.

Erriba: 424 700 mE; 5 410 600 mN

A radiometric high defining the true extent of MRV in areas mapped as Tb (McClenaghan and Green, 1999a). Located nine kilometres southwest of Wilmot between Cradle Mountain Road and the Wilmot River.

Lithologies are well exposed in recent logging and plantation development roads. From east to west along the logging road the MRV comprises a mixed sequence (see sample 110013) including;

- 424 700 mE; 5 410 600 mN, sericitised/ foliated quartz phyric volcanic rock with lenses of grey finer grained silty volcanoclastic rocks and minor matrix supported mass debris flow (clasts <75 mm). Localized quartz/limonite veining occurs throughout. The sericitised quartz phyric unit is identical to that at the Masons Road radiometric high.
- quartz grit, silicified with disrupted lenses and clasts of hematitic chert, outcrops 25 m north of the above.
- 424 675 mE; 5 410 625 mN, cream-greenish siltstone with strong cleavage.
- 424 550 mE; 5 410 650 mN, andesitic? volcanic/ clastic rocks, plagioclase and mafic (chloritised) phyric rock with magnetite grains (<20 SI) and minor epidote. These volcanic rocks are coincident with the eastern extent of a large magnetic high which extends from the Smiths Plains area.
- 424 450 mE; 5 410 800 mN, medium grained volcanoclastic rocks with abundant rock fragments in a crystal matrix, some with magnetite grains.

There may be some economic potential for VHMS in the area as indicated by:

- change from felsic to intermediate volcanism;
- some sericitic and limonitic volcanic rocks;
- hematitic chert/exhalite fragments.

Upper Castra: 425 750 mE; 5 425 200 mN

A weak radiometric high in an area mapped as Tertiary basalt on the Sheffield geological map sheet (Jennings *et al.*, 1959), 1.5 km northwest of Upper Castra in the headwaters of the Gawler River.

Outcrop on the western side of the creek is of fine-grained pumiceous sandstone, while on the eastern side a small quarry exposes well bedded (040.80), slightly micaceous, tuffaceous siltstone-sandstone.

Only the southwest sector of the radiometric feature has been checked; this extends ~750 m to the northeast.

Austamax carried out some reconnaissance mapping and stream-sediment sampling in the mid 1980's but most of this work may have been a few kilometres to the north of the radiometric feature.

Ghost Road: 426 000 mE; 5 423 500 mN

Radiometric high between Ghost Road and Castra Road at Upper Castra.

Undifferentiated felsic volcanic/clastic rocks are more extensive than shown on the Sheffield geological map sheet (Jennings *et al.*, 1959), the Tertiary basalt contact is located further to the north and coincident with the northern limit of the radiometric high.

Gads Hill: 431 700 mE; 5 395 500 mN

Coincident radiometric high and magnetic low in an area mapped as Tertiary basalt on the Sheffield geological map sheet (Jennings *et al.*, 1959). Location is 25 km SSW of Sheffield along Gads Hill Road and a power line access road.

Exposure in a quarry at 431 500 mE; 5 396 100 mN is of a fine-grained, foliated-crenulated, flecked with cream feldspar, sericitic-chloritic metasedimentary rock, part of the Precambrian Dove Group pelitic schists (see sample 110019). Fine cream and dark green granular 'veins' could be aplitic? Banding 080.70 could be bedding.

On the western flank of the quarry the metasedimentary rocks are unconformably overlain by Cambrian-Ordovician quartzite and siltstone. The quartzite is bedded, shallow dipping, silicified and slightly pyritic. Some quartz grains have a bluish tint, this colouring and silicification is similar to float seen in the Parkham area near Elizabeth Town.

Additional outcrops of the metasedimentary rocks are located 800 m southeast of the quarry.

Mt Roland: 440 000 mE; 5 411 000 mN

Radiometric high eight kilometres SSW of Sheffield on the northeast slope of Mt Roland.

The area is mapped as Qt on the Sheffield geological map sheet (Jennings *et al.*, 1959) but is underlain by undifferentiated Cambrian volcanic rocks.

The site has not been checked in the current work but the area has been explored by mining exploration companies.

Radiometric and/or magnetic anomalies

Nolan Hill: 398 265 mE; 5 434 770 mN

Magnetic high four kilometres NNE of Hampshire.

This feature has not been checked as part of the current program but was explored by Comalco in the late 1970's (Askins, 1978). The magnetic high was considered to be associated with Tertiary basalt. A similar strong magnetic high at approximately 400 800 mE; 5 435 000 mN 2.5km ENE of Nolan Hill was drilled as a magnetite skarn target but intercepted a basaltic deep lead adjacent to the Housetop Granite, indicating that extreme topography existed pre-Tertiary basalt in the area.

Kara Road: 400 000 mE; 5 426 750 mN

Radiometric high (uranium) five kilometres SSE of Hampshire.

Extensive outcrop-subcrop of calcsilicate hornfels. The hornfels is grey-pink, bedded (~350.30) with disseminated and diffuse bands of pyrrhotite and minor epidote on joints. Scattered blocks of garnet? pyroxene skarn float are associated with the eastern sector of the radiometric anomaly.

The hornfels probably represents the basal transition beds of the Gordon Limestone.

No other minerals of interest were noted but the traverse was only of a reconnaissance nature.

Other radiometric/magnetic features around the southwest margin of the Housetop Granite will be more effectively assessed by researching the company reports from the 1970's tungsten exploration programs.

Carruthers Creek: 417 000 mE; 5 394 500 mN

Two weak ENE-trending magnetic highs occur within the area, one of these in Carruthers Creek has been traversed.

The features are located seven kilometres northeast of Cradle Valley and a few kilometres outside the national park. The area can be accessed by forestry roads off Cradle Mountain Road although the bridge over the Dove River has been washed out so access is only possible when river levels are low.

Metamorphic rocks exposed are similar to others in the Dove area and magnetic susceptibilities ranged from 0.01 to 0.35 SI, which are typical of the surrounding lithologies.

The source of the magnetic features has not been resolved.

Wilmot Dam–Bell Creek: 422 500 mE; 5 408 600 mN

Radiometric high coincident with mapped Om and Of on the Cethana geological map sheet (McClenaghan and Green, 1999b). The basal Ordovician siliclastic rocks are usually associated with radiometric lows.

A traverse was made down the Wilmot River from the dam site then returning along Bell Creek, points of interest include:

- 75 m below the dam at 422 450 mE; 5 408 600 mN there is a faulted contact between Om (south) and a clayey weathered silty sericitic unit (fault 095.90), this relationship is also exposed on the road just to the east;
- from ~300 m below the dam to the Bell Creek confluence, interbedded tubicular quartzite with maroon, slightly hematitic sandstone and minor limestone beds;
- at 422 700 mE; 5 408 600 mN, on a quarry access road, a deeply weathered clayey siltstone with fragments of black chert and limonitic nodules <0.5 m is exposed. This is similar to the sericitic unit just below the dam.

The sericitic-clayey lithology is the most likely source of the radiometric high. On the Cethana geological map (McClenaghan and Green, 1999b) this is mapped as Of (Moina sandstone–Gordon Limestone transition). Based on the radiometrics it is more extensive than shown.

The Of transition sequence at the Wilmot Dam is quite different from that at Moina, is this just a lack of hornfelsing?

Has this weathered, sericitic and locally limonitic unit any significance re the source of alluvial gold at Bell Mount?

Ghost Road: 426 100 mE; 5 422 800 mN

Radiometric high, not detectable in the 1:100 000 scale data set, located two kilometres southwest of Upper Castra.

Quarry developed in fine-grained, cream, massive, felsic-derived volcanoclastic rock. The development of clay and sericite is similar to elsewhere in the district, so the radiometrics are probably responding to the extent of exposure?

Other points of interest along Ghost Road include:

- a medium-grained quartz feldspar porphyritic intrusive rock at 426 250 mE; 5 423 000 mN;
- Cambrian outcrop extends further north than is shown on the 1:250 000 scale geological compilation, the actual boundary is defined by the radiometric high.

Masons Road: 428 000 mE; 5 411 000 mN

A discrete radiometric high located seven kilometres SSW of Wilmot.

Quartz sericite schist exposed in quarries. The schist is similar to that in the Erriba, Gowrie Park/Lemonthyme Road areas and is part of the MRV.

Limanes Road, Wilmot: 429 600 mE; 5 418 200 mN

Radiometric and magnetic high. Prominent outcrops of flow banded rhyolite (lava or dykes?) with sheeted

veinlets of quartz chlorite limonite magnetite (0–20 SI) (see sample 110009). Cgrd bodies are mapped in Narrawa Creek valley on the Wilmot geological map sheet (McClenaghan and Green, 1999a).

CRAE located stream Cu anomalies and tourmalinisation in the area and carried out grid-based mapping and geochemistry, the area may have been called the Falls Creek prospect.

Machinery Creek: 430 500 mE; 5 405 000 mN

Isolated radiometric high 18 km southwest of Sheffield in the Machinery Creek gully below the Lorinna and Lemonthyme roads.

Gordon limestone and felsic volcanic rocks are fault juxtaposed (McClenaghan and Green, 1999b). Current traverses located unaltered limestone in Machinery Creek and sericitised quartz phyric volcanic/intrusive rock on Lemonthyme Road 500 m east of the anomaly.

The area has probably been explored by several companies and these reports should be evaluated if further assessment is required.

Wilmot River: 431 390 mE; 5 424 240 mN

Radiometric high, not detectable in the 1:100 000 data set. This site has not been visited but the radiometric response probably corresponds to more extensive bedrock exposure and/or shoal development in the river. An island is shown in the river at this location on the 1:25 000 scale topographic and a ridge of higher radiometric responses is coincident with the river.

Wilmot: 431 400 mE; 5 420 350 mN

A radiometric high, partially coincident with the Frankcombes Road magnetic high, is located three kilometres north of Wilmot between Murfetts and Wilmot roads. The area is in pasture and potato fields, with best exposure/subcrop on Burton's and Richard's properties.

Lithologies associated with the radiometrics are part of the MRV and include:

- weakly chloritised/sericitised feldspathic sandstone;
- olive green slightly limonitic siltstone;
- fine to medium-grained equigranular feldspathic sandstone (microgranite?);
- quartz chlorite vein/breccia;
- breccia/conglomerate, subrounded fragments <25 mm including clear vein quartz and sucrose quartz (see sample 110008).

Other points of interest in the area include:

- gossanous rubble used in laneway construction at this site has been carted from a quarry on Linnanes Road (429 300 mE; 5 418 900 mN). This gossan is hosted in Cambrian siltstone and was probably covered by CRAE's exploration in the late 1970's;
- a hill mapped as Roland Conglomerate (Or) on the Sheffield geological map sheet (Jennings *et al.*, 1959)

at 431 600 mE; 5 420 000 mN lies within the radiometric high and is underlain by similar Cambrian lithologies as described above. Unit Or is limited to a small outcrop on the eastern flank of the hill at 431 700 mE; 5 420 000 mN. The Or occurrence is surrounded by Cambrian rocks and is probably a fault-bound slice, this northerly trending fault may be a significant structure in the area, bounding Or 500 m east and 1000 m northeast of Wilmot and at 431 600 mE; 5 415 750 mN two kilometres south of the town near Strathbogie Road. A more northerly trending splay of the fault displaces the Cambrian-hosted magnetic high at Wilmot.

Payne Creek: 431 600 mE; 5 429 650 mN

Radiometric high near Swamp Creek Road, Sprent (not detected in 1:100 000 scale data) coincident with recent clear felling and road building. Outcrops of fine-grained, cream vitric tuff similar to that at Ghost Road.

Swamp Road: 432 730 mE; 5 429 740 mN

Radiometric high 3.8 km ESE of Sprent via Swamp Road not detectable in the 1:100 000 scale data.

Contact between Tertiary basalt to the north and Cambrian vitric tuff to the south, the tuff is dark grey, very fine grained and cherty with a conchoidal fracture. There seems to be nothing anomalous about the site in regards to the source of the radiometric response.

433 700 mE; 5 404 200 mN

Isolated radiometric high 17 km southwest of Sheffield on an un-named tributary of the Mersey River.

The site has not been ground checked but is coincident with mapped Cambrian felsic volcanoclastic rocks (McClenaghan and Green, 1999b). This and the Machinery Creek feature are located on a major northwest-trending fault system extending from Lake Gairdner to Standard Hill.

Martha Creek: 435 000 mE; 5 392 000 mN

Extension of a non-magnetic phase of the Dove Granite 28 km SSW of Sheffield, the feature is not detectable in the 1:100 000 scale magnetic/radiometric data sets held by the writer.

A traverse up Martha Creek for ~100 m from the Parangana Road located outcrops of grey phyllite with weakly chloritised metabasic-metadioritic dykes and angular float blocks of a cream 'quartzose' rock.

A thin section prepared by MRT of the dyke rock (see sample 110004), described as a meta-dolerite with actinolite and epidote, the alteration minerals are probably part of a regional metamorphic assemblage. A trace of pyrite and possibly chalcopyrite was identified in hand specimens.

The 'quartzose' rock (see sample 110003) was tentatively identified in the field as a carbonatised meta-basalt/diorite but has been shown in petrology

and XRD to be a pure quartzite with minor sericite and quartz veins with a trace of calcite.

Lake Paloona: 437 180 mE; 5 425 710 mN

Radiometric high, not detectable in 1:100 000 scale data set, located three kilometres northwest of Barrington on the eastern side of Lake Paloona in State Forest and accessed via Moreys Road, through Ken Huttons property, then onto forestry tracks.

The Sheffield geological map sheet (Jennings *et al.*, 1959) shows a faulted contact between units Cbc and Cgg at the site.

Moderately steep slopes with outcrop to subcrop of fine-grained cream volcanoclastic/vitric tuff and massive greywacke. Localised fine quartz veinlets, some with hydraulic fracturing and limonitic veinlets indicating that the rocks have been subject to some hydrothermal activity.

The radiometric high has not been explained but may be associated with areas of more extensive exposure. Before further field work is carried out Austamax's reports on the Paloona EL from 1984 should be reviewed.

Hendersons Road: 438 190 mE; 5 424 740 mN

Radiometric high, not detectable in 1:100 000 scale data set, located two kilometres northwest of Barrington in paddocks on several small acreage blocks.

The area of interest is grass covered and subcrop is restricted to laneway cuttings. The main lithology is a fine grained volcanoclastic rock-vitric tuff similar to the Lake Paloona rock. The radiometric feature has not been explained.

Residents mentioned that bore water from the general area at the end of Henderson Road has a bluish colour when taken from their hot water taps. The water is probably slightly acidic, stripping copper from the hot water cylinders?

Barrington: 438 400 mE; 5 423 610 mN

Radiometric high, not detectable in 1:100 000 scale data set, located 1.2 km west of Barrington in a recently planted eucalypt plantation on Brian Harris' property.

Extensive outcrop to subcrop of fine-grained volcanoclastic rock similar to Lake Paloona but with more localised deeply weathered, pink, medium grained, greywacke or intermediate-felsic intrusive rock, flecked with limonite (some after pyrite). This latter lithology may be the radiometric source.

Minnow Falls: 442 500 mE; 5 406 500 mN

Coincident radiometric and magnetic high located 12 km south of Sheffield on a sharp east-west divide between the Minnow and Mersey rivers. Lies partly within the Mt Roland (Proposed?) Protected Area.

The traverse located float/subcrop of the following:

- quartz porphyry, some with limonite/goethite and magnetite veining;

- brecciated felsic volcanic? rock <10 mm scale jigsaw fit hydraulic fracturing;
- massive magnetite vein blocks with minor limonite after pyrite?

A representative suite of lithologies is included in sample 110002.

The Sheffield 1:63,360 scale geological map sheet (Jennings *et al.*, 1959) shows the area lying within unit Cgg near the Ordovician contact.

The area was most likely included within the CRAE (?) stream-sediment program which located the Fire Tower Au anomaly and a literature search should be carried out prior to further field work. From the WTRMP data the area lies on the same ESE-trending structure as the Fire Tower Prospect which is located 3.7 km to the east.

Paradise Plantation: 443 000 mE; 5 407 000-5 410 000 mN

A prominent north-trending magnetic high located ten kilometres south of Sheffield is coincident with a multiphase mafic-intermediate Cambrian intrusive complex. Exposure is moderate along a network of logging roads but some bedrock is masked by scree soils from Mt Roland.

Intrusive rocks include:

- fine-grained, slightly ophitic to plagioclase porphyritic textured basic;
- clayey weathered/altered fine-grained, with fine biotite? and plagioclase phenocrysts;
- pyroxene/hornblende, plagioclase porphyritic andesite some with pink flooding/veining which is most likely albite.

A suite of intrusive rock types is included in sample 110001.

Magnetic susceptibility values for porphyritic rocks range from 10-20 SI and scattered magnetite grains are common. The finer grained type has magnetic susceptibilities of 1.0 SI, which is similar to Tertiary basalt at Paradise two kilometres due north. These may be Tertiary basalt dykes?

Union Bridge Road: 445 000 mE; 5 404 300 mN

Located 13 km south of Sheffield and 1.5 km southwest of the Fire Tower gold prospect. Radiometric high in an area mapped as Qt on the Middlesex geological map sheet (Jennings and Burns, 1958).

Chlorite/sericite altered quartz phyric volcanic/intrusive rocks, some associated with limonite/goethite, are exposed in road cuttings. The iron is probably sourced from the chlorite or possibly sulfide minerals. Most of the area is mantled by quartzose scree with a brown slightly clayey matrix.

The radiometric anomaly seems to be bounded by a north-trending structure in the east. In the radiometrics this feature can be seen to extend south of the Sensation Gorge in the Standard Hill anticline. A

traverse along the southern part of the anomaly in the Sensation Gorge failed to locate anything of significance.

Magnetic highs associated with the Cambro–Ordovician transition

Lower Beulah

There are two magnetic components to this feature, one within the Cambrian and the other in the overlying Cambro-Ordovician transition. Detrital magnetite in the latter may have been derived from the Cambrian volcanic rocks.

The Cambrian feature is located between the Beulah and Lower Beulah roads, an area 3.5 km north-south and 1.5 km east-west. The magnetic high is associated with a porphyritic (mafic) andesite-dacite? (Beulah Formation, Jennings *et al.*, 1959) which is slightly hematitic and chloritised. Some of the pink colouring may be due to kspars, as there is a radiometric high coincident with the eastern extent of the feature. Magnetic susceptibilities range up to 35 SI. Outcrops of the andesite-dacite have been located at 450 400 mE; 5 410 200 mN and 451 100 mE; 5 409 900 mN, the latter with highest magnetic susceptibilities (see sample 110016).

The Cambro–Ordovician feature is a more linear magnetic high located midway up the western slope of Conglomerate Hill. At 451 200 mE; 5 410 700 mN several magnetite bearing lithologies occur as float (sample 110017) and include:

- hematitic sandy siltstone (0.35 SI);
- felsic volcanoclastic rock with rounded sucrose quartz fragments (some limonitic) and chloritic fragments (glass?) in sericitic groundmass (0.6 SI);
- mixed provenance fine conglomerate with felsic volcanic rock and probable Precambrian detritus (6.75 SI).

The overlying, east dipping Roland Conglomerate has magnetic susceptibilities <0.05 SI.

Magnetic features that are most likely associated with the Cambro-Ordovician have been traversed at 450 700 mE; 5 412 000 mN and 450 300 mE; 5 415 000 mN but at both localities the lower Palaeozoic is obscured by younger rocks, the former by Permian conglomerate and latter by Tertiary basalt.

A similar looking linear magnetic high occurs adjacent to basal Ordovician conglomerate at the northern end of The Badgers range at 440 500 mE; 5 425 800 mN. Tertiary basalt is the most likely source of anomaly.

Wilmot

As with the Lower Beulah feature there appears to be two components contributing to the magnetic anomaly, an intrusive mafic–intermediate unit in the

Cambrian and a stratabound unit within the Cambrian–Ordovician transition. The latter anomaly source can be further divided into a detrital magnetite component in the basal Roland Conglomerate (Or) and magnetite veining in the upper Cambrian.

Radiometric highs are associated with parts of the Cambrian-hosted magnetic anomalies at Linnanes Road and in the vicinity of Frankcombes Road.

Cambro–Ordovician feature: A stream traverse from 431 700 mE; 5 419 600 mN to 432 100 mE; 5 418 750 mN cut through a section of the anomaly. Scattered outcrops of bedded pebble conglomerate (jasper fragments) and quartzite with magnetic susceptibilities ranging from 0.05 to 0.35 were located. Pebbly sandstone float blocks with fine detrital magnetite (3.30 SI) were located 100 m south of the western end of the traverse (see sample 110015). The trend of the magnetitic anomaly in this area is consistent with measured bedding strikes of 210.45.

At 432 100 mE; 5 418 750 mN a silicified and locally pyritic sandstone and conglomerate crops out; this has been interpreted as greybilly (see sample 110014).

Weathered quartzose volcanoclastic rocks and dykes? of diorite–quartz diorite with scattered sheeted quartz chlorite limonite magnetite veinlets occur at 429 200 mE; 5 417 800 mN and 430 000 mE; 5 417 800 mN on Narrawa Road. These rocks have magnetic susceptibilities ranging from 0 to 20 SI (see samples 110006 and 110007). This magnetite occurrence is 100 m stratigraphically below the basal Ordovician sandstone but still seems to be stratabound. The basal Ordovician siliclastic rocks are pyritic rather than hematitic, similar to those in the Moina–Cethana area.

Cambrian feature, in vicinity of Wilmot and Frankcombes roads: Epidote, chlorite ± pyrite altered diorite–gabbro occurs predominantly as float blocks, the only outcrop being located at 431 900 mE; 5 419 200 mN in a dam excavation. Float blocks (Sample 110010) of the intrusive rocks have been located in stone heaps which have been carted off paddocks on properties 3832 (Madden) and 1978 (Murfett), although the exact locations on these properties have not been ascertained. Magnetic susceptibilities range from 0.35 to 50 SI.

At Linnanes Road (429 600 mE; 5 418 200 mN), prominent outcrops of flow-banded rhyolite lava or dykes? (Sample 110009) with sheeted veinlets of quartz chlorite limonite magnetite (0–20 SI) contribute to the magnetic anomaly. A radiometric high is also associated with the rhyolite.

CRAE located stream Cu anomalies and tourmalinisation in the Linnanes Road area and carried out grid-based mapping and geochemistry; this may have been called the Falls Creek prospect.

Radiometric features associated with post-Carboniferous rocks

Upper Calder-Takone

A NNW-trending set of four radiometric/magnetic mismatches with the mapped geology (see Burnie geological map sheet; Gee *et al.*, 1968). It was interpreted that the responses would define a significant fault structure associated with pre-Permian basement lithologies, although only Permian rocks and Tertiary basalt were located and no evidence for the structure was found.

Locations ground checked are as follows:

- *Upper Calder* (384 750 mE; 5 455 000 mN); a NNW trending radiometric high. Two east-west traverses across a NNW-flowing tributary of the Inglis River 1.2 km northwest of Upper Calder located good exposures of bedded Permian mudstone and tillite. Tertiary quartzose pebble gravel blankets the Permian immediately west of here and is coincident with radiometric lows. The radiometric feature is coincident with rock units P-Cwt which were mapped on the Burnie geological map sheet (Gee *et al.*, 1968) but not transferred to the 1:250 000 scale compilation.
- *Kellatier* (385 750 mE; 5 450 300 mN); Radiometric low coincident with mapped Permian rocks. A traverse was made 500 m WNW of the Calder/Oldina roads junction along a farm track to an irrigation dam. Permian tillite and mudstone crop out on the west side of the dam with weathered basalt or possibly dolerite on the eastern side. The radiometric low is associated with the latter. The Permian-Tertiary contacts could be remapped.
- *Takone* (386 200 mE; 5 440 500 mN); Radiometric low coincident with mapped Permian rocks. Traverses along logging roads 1.5 km southeast of Takone, located basalt/dolerite soils but no Permian rocks. Contacts need remapping.

Tewkesbury: 390 000 mE; 5 434 500 mN

Radiometric low coincident with mapped Permian rocks on the Burnie geological map sheet (Gee *et al.*, 1968).

A traverse one kilometre west of the old Tewkesbury Research Station in the East Cam River located Tertiary basalt outcrop. Contacts need remapping.

Lorinna: 429 000 mE; 5 400 000 mN

A well defined north-trending magnetic high and diffuse, weak radiometric highs are located 23 km southwest of Sheffield at Lorinna, on the eastern side of Lake Cethana.

The radiometric feature has not been visited as part of the current program but mapping, carried out by Comalco Exploration in the late 1970's, located sub-basaltic Tertiary carbonaceous mudstone under a thin veneer of Tertiary basalt scree soils. The magnetic

feature is coincident with the western edge of the Tertiary basalt.

Exploration in the Lorinna valley by the Mount Lyell Mining and Railway Company (late 1960's) and Comalco Exploration (late 1970's) targeted magnetic anomalies which were interpreted to be associated with the Bismuth Creek Fault. The main anomaly investigated is located 2.5 km northwest of the current area of interest.

Liena: 434 500 mE; 5 400 000 mN

A discrete but weak radiometric high 21 km SSW of Sheffield.

Intra-basaltic or sub-basaltic (Tb) quartz grits and carbonaceous mudstone are exposed in recent forestry road works. The setting is very similar to the Lorinna radiometric feature, with both areas covered by a thin mantle of Tertiary basalt scree soils.

Long Hill Plantation: 460 300 mE; 5 422 500 mN

Radiometric low over mapped Permian rocks 13 km NNW of Elizabeth Town on the western side of the Bass Highway.

The low is associated with grey sandy soils with occasional blocks of limonite-cemented quartz sand grit, probably Tertiary.

Parkham: 468 600 mE; 5 415 000 mN

One of several weak but well defined north-trending magnetic highs 'stripes' nine kilometres northeast of Elizabeth Town, in the vicinity of Davies, Maloneys and Bradys roads.

The anomaly is in an area of low-lying farm land, the only outcrop/subcrop located is of quartzose pebble conglomerate of probable Tertiary age at 469 000 mE; 5 416 000 mN.

There is no indication of the anomaly source. The only features of interest in the area are cobbles and subangular blocks of siliceous and slightly pyritic sandstone? These cobbles are widespread and possibly shed from Permian conglomerate (see sample 110005).

Stephens Hill: 473 300 mE; 5 413 000 mN

Magnetic high 'stripe' as for Davies Road, 11 km ENE of Elizabeth Town.

Continuous outcrop to subcrop of Jurassic dolerite with magnetic susceptibilities ranging from 1.0 to 2.0 which appear to be typical for the dolerite in the area.

The source of the magnetic anomaly has not been identified.

Blackwood Park: 478 500 mE; 5 409 200 mN

Radiometric high 15 km east of Elizabeth Town via Porters Bridge Road. The anomaly is coincident with Tertiary ferricrete/laterite with cream kaolinitic clay developed on dolerite and basalt.

Brushy Rivulet: 482 300 mE; 5 407 500 mN

Radiometric high coincident with clayey Tertiary ferricrete/laterite mantling Jurassic dolerite 19 km east of Elizabeth Town via Porters Bridge Road.

Radiometric differences in Tertiary basalt

Burnie-Highclere-Hellyer River

There seems to be a correlation in the radiometric and magnetic responses in Tertiary basalts which could reflect compositional differences between the earlier/stratigraphically lower flows and the later flows occurring at higher elevations.

Basalts north to northeast of a line from Hellyer Gorge Reserve through the southern margin of Snowdon Plain to ~2.5 km north of Companion Hill are associated with a higher radiometric response and greater magnetic gradients compared to those to the south of this line.

An explanation for the differences (J. Everard, pers. comm.) is that the earlier flows exposed at lower elevations near the coast are more alkaline, while the higher/later flows are more tholeiitic (Appendix 2).

Preston: 419 500 mN; 5 425 600 mE

A weak radiometric high in an area mapped as basalt (Jennings *et al.*, 1959) is coincident with a 540 mRL hill five kilometres southwest of Preston at Warringa. Basalt in the area tends to be mafic porphyritic with olivine-rich segregations.

The aeromagnetics show that all basalts at Preston through to Riana and Sulphur Creek are more magnetic, and are probably part of the same flows which have since been dissected by the Leven River.

Regional interpretations

Several regional features became apparent during the course of the field work, some of them not stemming directly from the aeromagnetic/radiometric data base, but are included here for the record.

Companion Fault: 393 000 mE; 5 424 000 mN

A major north-trending fault with east-side-down juxtaposing the basal Ordovician with Precambrian-Cambrian greywackes is interpreted just west of Companion Hill. The west-dipping Odc of Companion Hill (Baillie *et al.*, 1986) would indicate that the Gordon Limestone (Og) is the most likely unit to occur beneath Tertiary Basalt (Tb) cover adjacent to the fault on the eastern side.

A magnetic high is coincident with the interpreted Og position (393 200 mE; 5 425 000 mN) and may reflect magnetite skarns. A second magnetic high centred at 394 200 mE; 5 427 500 mN could also be an Og-hosted skarn. Both areas are basalt covered and the magnetic source may be the basalt. Some magnetic modelling is required to resolve this.

Beulah Granite dome/diapir

There appears to be a dome-like feature surrounding the Beulah intrusive rocks. This is most apparent on the Sheffield map geology and is reflected in the following:

- structural trends in units Cgg and Cmk to the west, southwest and south of the Beulah granites appear to wrap around the intrusive rocks;
- bedding trends in units Or and Om deviate from the regional WNW trend at Mt Roland to the west and in the Beulah/Stoodley area to the northeast of the intrusive rocks;
- granites primarily emplaced within unit Cgg.

Are the barytes and gold occurrences in the Mt Roland/Beulah area associated with the Beulah granite? If so is the northeast Cambro-Ordovician contact zone between Sheffield and the Mersey River prospective for Fire Tower style gold?

Dove Granite at Gads Hill and the Bismuth Creek Fault

Medium to coarse-grained pink granite crops out along Gads Hill Road and the power line access road between 432 500 mE; 5 395 700 mE and 434 000 mE; 5 394 300 mN. The granites are strongly chloritised and magnetic susceptibilities range from 0 to 7 SI (see sample 110019).

The radiometrics and magnetics define a sharp southwest margin to the granite. This contact with the Precambrian rocks is interpreted as faulted and is probably the southeast continuation of the Bismuth Creek Fault at Moina, 15 km to the northwest.

It is unlikely that the granite is a narrow dyke-like body as all outcrops seem uniformly medium to coarse grained, with no evidence of margin chilling.

Part of the granite mapped southwest of this fault (in the Middlesex geological map sheet; Jennings and Burns, 1958) in the Mersey River area lacks the magnetic character associated with granite elsewhere and may be a different phase or part of the Precambrian metasedimentary rocks.

The age of the Bismuth Creek structure here appears to be pre-Ordovician. The Moina Sandstone equivalent quartzites are shallow dipping and are apparently continuous across the interpreted fault.

Dove Granite and Bond Range porphyries

The Dove Granite occurs mainly within the pelitic metasedimentary rocks of the Precambrian Dove Group (Jennings and Burns, 1958) near their northern-most exposure, where they are partially overlapped by Cambro-Ordovician siliclastic rocks. Is this coincidence? The Cambrian porphyries (Cqfbp) between Mt Remus and Bonds Range (Vicary and Pemberton, 1988) occupy a similar stratigraphic position. Why? Are the Dove Granite and Bond Range porphyries related magmatically?

NNW-trending fault, Standard Hill-Forth River estuary

Magnetic anomalies at Paradise, just east of Mt Roland, have strong NNW trends which may reflect a regional NNW-trending structure extending north to the coast just west of the River Forth estuary. This trend can also be seen in the total count radiometrics.

South of 5 450 000 mN the structure turns slightly SSW.

Has this any regional exploration significance? The Fire Tower prospect is located 500 m east and at point where the SSW deflection starts.

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[31 January 2002]

APPENDIX 1

Rock sample locations and descriptions

Sample 110001, Paradise Plantation (443 000 mE; 5 410 000 mN)

Basic to andesitic intrusive rocks;

- fine grained, slightly ophitic to plagioclase porphyritic textured basic;
- clayey weathered/ altered, fine grained, with fine biotite? and plagioclase phenocrysts;
- pyroxene/hornblende plagioclase porphyritic, some with pink flooding/veining which is most likely albite.

Sample 110002, Minnow Falls (442 500 mE; 5 406 500 mN)

Float to subcrop;

- quartz porphyritic volcanic/intrusive rock, some with limonite/goethite and magnetite veining;
- brecciated felsic volcanic? rock <10 mm scale jigsaw fit, hydraulic fracturing;
- massive magnetite vein blocks with minor limonite after pyrite?

Sample 110003, Martha Creek (435 000 mE; 5 392 150 mN)

Stream float, fine grained, cream-white, possibly carbonatised.

Sample 110004, Martha Creek (435 000 mE; 5 392 150 mN)

Meta diorite? slightly chloritised, trace pyrite.

Sample 110005, Parkham (468 700 mE; 5 415 000 mN)

Cobbles and float blocks of siliceous and weakly pyritic sandstone–greywacke.

Age? Tertiary, Permian or clasts from Permian tillite?

Sample 110006, Wilmot (430 000 mE; 5 417 800 mN)

Quartzose volcanoclastic rock.

Diorite–quartz diorite, chloritised with minor quartz chlorite veinlets.

Sample 110007, Wilmot (429 200 mE; 5 417 800 mN)

Rhyolitic intrusive? rock, sericitised plus quartz veinlets.

Sample 110008, Wilmot (432 500 mE; 5 420 300 mN)

Pebble conglomerate, clasts include vein quartz and fine-grained quartz sericite metasedimentary rocks?

Pumiceous sandstone–siltstone.

Sample 110009, Wilmot (429 600 mE; 5 418 200 mN)

Rhyolite, feldspar porphyritic, flow banded, minor sheeted veinlets of quartz, chlorite, limonite and magnetite.

Sample 110010, Wilmot (432 000 mE; 5 419 800 mN)

Gabbro–diorite, minor chlorite, epidote, trace pyrite alteration, weak to strongly magnetic.

Sample 110011, Two Hummocks (399 500 mE; 5 413 600 mN)

Brecciated pink quartz feldspar (90% ksp, 10% plag?), porphyritic, magnetite-bearing rhyolite.

Brecciated fine to medium grained, strongly porphyritic rhyolite? Mixing and milling of clasts, quartz matrix, most likely hydrothermal. Leached cavities could be after sulfide minerals and/or carbonate.

Chlorite sericite altered rhyolite? Possibly brecciated.

Sample 110012, Rabbit Plain (396 700 mE; 5 415 850 mN)

Sandstone, limonitic with scattered pyrite clasts/nodules.

Sample 110013, Erriba (424 700 mE; 5 410 600 mN)

Quartzose grit with jasper lenses/clasts.

Andesite.

Andesitic-dacitic lava, feldspar porphyritic, abundant magnetite grains.

Sample 110014, Wilmot (432 100 mE; 5 418 750 mN)

Greybilly, siliceous with fine disseminated pyrite.

Sample 110015, Wilmot (431 900 mE; 5 419 100 mN)

Pink sandstone with pebbly bands + detrital magnetite.

Sample 110016, Lower Beulah (451 100 mE; 5 409 900 mN)

Dacite? porphyritic, slightly hematitic, mafic minerals chloritised, strongly magnetic.

Sample 110017, Lower Beulah (451 200 mE; 5 410 700 mN)

Hematitic sandy siltstone (0.35 SI).

Felsic volcanoclastic rock with rounded sucrose quartz fragments (some limonitic) and chloritic fragments (glass?) in sericitic groundmass (0.6 SI).

Mixed provenance fine conglomerate with felsic volcanic and probable Precambrian detritus (6.75 SI).

Sample 110018, 431,400 mE; 5 420,350 mN Wilmot

Greywacke/microgranite?, fine grained equigranular, quartz feldspar ± mica.

Pumiceous volcanoclastic rock, slightly chloritised.

Sample 110019, Gads Hill (431 700 mE; 5 395 500 mN)

Granite, red-green, mafic minerals chloritised, magnetite bearing.

Precambrian metasedimentary rock, fine grained, slightly chlorite/sericite altered.

Moina Sandstone, quartzose grit, siliceous with trace pyrite.

APPENDIX 2

Radiometric response of Tertiary basalt

J. L. Everard

There are compositional differences in Tertiary basalt in the Burnie–Hellyer River–Waratah area. The basalts south of Hellyer Gorge (roughly) are mostly tholeiites. Those around Hampshire and north to the coast are mostly alkali basalts. The latter would have higher K_2O and probably also higher Th and U (although Th and U levels are too low to accurately analyse by XRF). Most of the available data is in the St Valentines Explanatory Report (Seymour, 1989); data from nearer the coast (Burnie Quadrangle) are more sparse. The alkali basalts also tend to have higher total iron (Fe_2O_3/FeO and TiO_2) than the tholeiites, thus more titanomagnetite, and higher magnetic susceptibility. However other factors such as cooling rates and grain size are probably important. In the early 1990s an APPM soil scientist was interested in this issue with regard to soil fertility in plantations in the area. We found that magnetic susceptibility had too loose a correlation with potash content in basalts to be of much use.

Further west in the West Takone–Meunna–Pipeline Road area (Trowutta 1:50 000 scale geological map sheet), chemical analyses and petrography of the basalt suggest that there is a lower unit of strongly alkalic basalt (basanite), whilst at the top of the pile the younger flows are only mildly alkalic (with lower K and probably Th and U). This relationship probably also occurs in the Doctors Rocks–Somerset area (e.g. Sutherland and Wellman, 1986).