

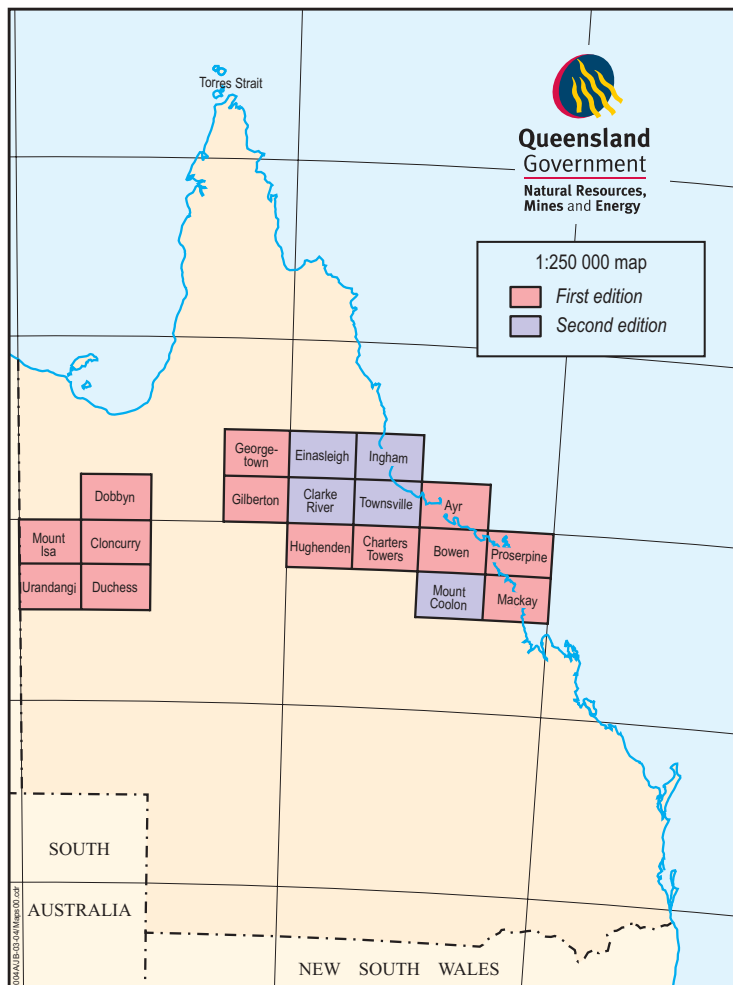
GOLD OCCURRENCES IN NORTH QUEENSLAND

Extracts from the Queensland Mining Guide

No attempt is made in this portion of the Mining Guide to deal with the past history of the various mining fields or to describe the many mines being worked in the State. The object rather is to show - both to the individual prospector and to the mining investor - some of the mining possibilities of each of the districts mentioned, passing reference being made to particular mines in certain cases only. Slight reference only has been made to geological features.

The relative importance of deposits and districts mentioned cannot be gauged by the lengths of the references in these notes. On many of the old fields the conditions are well known, or can be ascertained at the main centres. Special attention has been drawn to some of the lesser known fields.

General area covered by this report



Any person or company desirous of obtaining further details in relation to any of the mines, deposits, or localities referred to should communicate with the Department of Natural Resources, Mines and Energy, Brisbane, or with the nearest Warden, Inspector of Mines, or District Geologist.

The Reworking of Deposits

The fact that certain ore-bodies were worked years ago and were abandoned does not necessarily imply that such deposits cannot be worked profitably under different conditions. The metal market is always a primary factor in deciding the success or failure of mining ventures. The utilization of modern methods of mining and treatment may bring renewed life to some mines.

Some of the causes of work have been discontinued in mines are:

(1) (Want of sufficient capital to explore and develop deposits thoroughly

- (2) (High cost of transport of ore to treatment works
- (3) The premature erection of costly plants at mines before requisite values and quantities of ore have been proved
- (4) Failure in prosperous periods to build up a reserve fund for the express purpose of carrying out further developmental work
- (5) Exceptional conditions such as drought, flooding and labour difficulties.

Any person wishing to investigate the further possibilities of any worked deposits or desiring to renew in any locality the search for any particular mineral should weigh all the known factors relating to the closure of previous workings. Some of the factors may be gathered from these notes; others can be obtained from official records or from officers of the Department of Natural Resources, Mines and Energy stationed on the various mining fields.

Fresh Discoveries

Although most of the larger and more obvious outcrops of mineral deposits have been located and tested to some extent there are still possibilities of new discoveries within the metalliferous areas of the State.

The fact that in these notes some localities are mentioned as being worthy of further prospecting does not indicate that the other localities referred to should not also be prospected. The special mention is made only in cases where some of the factors making for success are known.

THE NORTHERN DISTRICT

In the *Mackay* district there has been some production in recent years from a few small copper mines on the *Mount Spencer* field and adjoining areas south-west of Eton, and near Bloomsbury. The most important was the *Pinevale Mine*, where a battery and concentrating tables were installed. A little gold has been won from mines near *Sunnyside* and *Sarina*, and on the *Eungella*, and *Nebo* fields. The reefs are mainly small but sometimes carry gold values, while some of the ores are too complex for profitable working. Renewal of interest since 1956 in the Mount Britton area on the Nebo field resulted in productive operations at one of the old mines.

On the *Grasstree Field*, 10km north-east of Sarina, at the Zelma mine, shoots of higher grade gold ore have been worked to shallow depth within an ill-defined zone of mineralization.

In the *Bowen* district, by far the largest gold-producer has been the Duffer Mine, Dittmer, 26km by road west-south-west of Proserpine. This deposit, discovered in 1934, was a rich but small fissure-vein carrying low copper values, which has been worked to an inclined depth of about 213m. Extensions of the vein to both north and south of the Duffer lease have been prospected. The mine closed in 1951 and regular production has not been resumed.

Gold has been won about *Mount Hector*, 29km south-west of Proserpine. There are possibilities for further work on the *Normanby* goldfield, where comparatively little work has been done on the reefs in the sulphide zone.

Sellheim Field (148km south-west of Bowen). The centre is Ukalunda, and the best road access is now from Charters Towers, via Scartwater. Silver, lead and bismuth have been mined, and there has lately been renewal of interest. Mining activities in recent years have been confined to alluvial gold on the old Mount Wyatt Goldfield, where surface gold was traced to a deep lead beneath tableland sandstone at Rutherford's Table, 13km south-east of Ukalunda.

Mount Coolon (142 km south-west from Collinsville). The Mount Coolon goldmine, for some years one of the State's major producers, closed in 1939 because of exhaustion of proved reserves.

Charters Towers (134km by rail from the coast at Townsville). Total yield of gold from the Charters Towers and the Cape River goldfields to date exceeds 211 000 kg. Maximum production was reached in 1899 with 9940kg. Renewal of prospecting in old workings in the Black Jack area led to production of some 1245kg between 1934 and 1951. Since that date gold mining on the field has languished.

Ore occurred in shoots in fissure reefs and showed general impoverishment in depth. The lowest workings reached 915m. In the absence of favourable information as to reserves and in view of the heavy cost of dewatering and reconditioning, it is considered unlikely that the central connected group of workings, including the former main producers, could be successfully reopened. Future prospects on the field must therefore, depend on further exploration and developmental work on outlying reefs which are widely distributed in the surrounding areas.

Groups of workings at the *Broughton, Rishton, Dreghorn, St. Paul's, Mount Leyshon, Lighthouse, Windsor, Southern Cross, Fern Springs* and *Newhaven* still offer possibilities for prospecting activity particularly in regard to selected portions adjacent to old workings.

Ravenswood (87 km by rail from Townsville to Mingela thence 42km by road). This field was one of the best producers in Queensland, the total yield being some 28 000kg. It is now almost completely defunct. Most of the yield has come from mines situated in the town, at *Brookville* and at *Sandy Creek*. The reefs occupied comparatively small but persistent fissures in granite. The sulphide ores, being complex, were not amenable to normal battery treatment and this somewhat retarded development. Payable ore was obtained to a depth of 215m, but only a few of the many reefs were worked below 120m. The Ravenswood reefs are considered to be far from worked out, although the fact remains that the 'cream' of the reefs has gone and a great deal of capital would be required to reopen and develop the old mines to a stage of production and to provide suitable treatment plant.

Other small reefs have been worked at outside centres such as the *Kirk, Rochford* and *Hillsborough*, and may still hold interest for the prospector or small syndicate.

At *Mount Wright*, 10km north-west of Ravenswood, a slightly shattered and mineralized zone in granite has been open-cut to over 30m for low average gold values, and boring has shown that there may be further limited reserves. The somewhat similar "*Welcome*" lode at Sala Siding has been proved by boring to offer little prospect for further development.

Ravenswood also forms the centre for prospecting operations in an area to the south which carries gold.

Lolworth (50km north-west of Pentland). Initial development took place many years ago, and numerous gold-bearing veins have since been worked. The most important deposits, however,

have been of the greisen pipe type, notably the Mons Meg and the Midas. Exploration has shown that there is no prospect for further production below the 60m level in the Mons Meg.

There is a wide extent of auriferous country between here and the Cape River, extending also south-easterly through Mount Stewart and the Homestead field to Allandale.

Pentland (238km by rail south-west of Townsville). In the deep lead of the Cape River a rich deposit of alluvial gold was followed southerly for nearly 6km at depths up to 30m, but generally much less. Investigation has shown that, contrary to general opinion, loss of the lead was not the cause of cessation of operations, the workings having been abandoned when the gold became scattered over a broader area downstream below a bar. The lead has never been traced to the original source of the gold.

Between Norwood and Specimen Hill, near the Balgay mine, a large amount of alluvial gold has been won from shallow ground. Many small, rich leaders occur in the locality.

Considerable attention has been paid in the past to the reefs at Mount Clearview, but the necessity for transporting the ore to Lolworth for crushing then hampered development.

Woolgar (129km north of Richmond) A number of gold reefs were worked with encouraging results many years ago. Following a revival in the thirties there has been subsequent intermittent small-scale mining, with local battery facilities.

Auriferous quartz reefs occur at Mount Emu Plains, to the north of Hughenden. Some difficulty was experienced in treating the sulphide ore with the crushing mill available on the field and later parcels were sent to smelters.

Reid River (65km by rail south of Townsville). Although small amounts of gold, both alluvial and reef, are found in the foothills of the Hervey Range.

Mount Success and *Far Fanning* (19km and 50km, respectively, north-west of Mingela).

At Mount Success, a few small veins of rich gold-bearing ore have been worked to a depth of 90m. There are several large bodies of low grade on which very little work has been done.

Investigation by a large mining company of the old Mount Success mine, abandoned in 1906, indicates that gold values are irregularly distributed in small erratic shoots and that prospects for resumption of mining are not bright.

A small group of deposits at *Far Fanning* occur in old sedimentary rocks and have been worked periodically to shallow depths. There is still scope for prospecting, but the area is handicapped by absence of water supply.

Gold, alluvial and reef, was worked in the early days a few miles north-west of the old Argentine township.

Star River. This field takes in a large area bounded on the west by the Burdekin River, on the east by the coast range and on the north by the Coane Range. Much of the area is isolated and rough and has received little attention. Copper, tin, wolfram and gold are known to have been worked in the past, the last notably at Piccadilly.

Kidston (42km south of Einasleigh) also called “The Oaks.” On this field alluvial production commenced in 1907; to the end of June, 1910, 588.26kg of gold were produced. Large bodies of low-grade gold ore have subsequently been worked by open-cuts, chiefly at Wises Knob. More recent attention has been towards working of groups of small leaders. Operations were facilitated by the existence of a State battery now out of commission. *Kidston* forms a centre for outlying areas to the south, at which wolfram, scheelite and gold-copper have been worked.

Forsayth (229km by rail south-west from Almaden) is the railhead and centre for the southern portion of the Etheridge goldfield, including the *Robertson River* silver-lead lodes. *Ortona* copper deposits, *Percyville*, *Mount Hogan*, *Mount Moran* and *Gilberton* gold lodes and *Mosquito Creek* silver-lead lodes. Near *Forsayth* itself a number of strong fissure lodes have been worked for gold on company scale. Rich ores characterized these deposits on the oxidized zone, but exploitation of the primary ore containing mixed base metal sulphides was restricted because of the difficulty of extracting gold therefrom on the field.

The isolated situation has always proved a handicap to continued development but the field, together with adjoining Georgetown district, is considered to offer distinct possibilities for further development by modern capitalized methods, particularly if provision can be made for realization of the base metal content of the ores as well as the gold and silver.

Georgetown (42km by road north from Forsayth) is the centre of the northern section of Etheridge field, outside gold centres being *Durham*, *Cumberland*, *Donnyville* and *Lighthouse*. The fissure veins of the area are characterised by exceptional length. Normally the stone became heavily mineralised in depth, but there were instances where the gold occurred mainly in specimen shoots. Sulphide ore mined was forwarded to smelters elsewhere, with prior concentration on the field in a few cases. Remarks on the potentiality of the veins on this field have already been made above in conjunction with the Forsayth area. On the *Green Hills* goldfield, 40km to the south-west, the alluvial deposits are now practically exhausted, but further rich leaders may be found in the vicinity of *Macdonaldtown* and *Western Creek*.

Croydon (222km by road westerly from rail at Forsayth) was formerly one of the major goldfields of the State, with a production exceeding 15 950kg fine gold, but mining has now ceased. A large number of flatly disposed persistent fissure lodes in granite and others, more steeply dipping in volcanic rocks were worked. They were characterized by rich shoots at the surface and by failure of values to live to depths exceeding a few hundred feet. Grade of bullion was variable but on the average rather low. Considerable exploration at greater depth, including drilling, was unsuccessful. The prospect of other similar deposits beneath shallow cover in adjoining areas of overlapping sedimentary rocks provides a possible avenue for future investigation.

Emeralda (97km southerly from Croydon) was the centre for gold mining on a limited scale in the southern section of the field.

THE PROSERPINE 1:250 000 SHEET AREA (BMR Report 144)

The most favourable area for possible gold mineralization is the contact of the Urannah Igneous Complex. Many small gold deposits are associated with the Lower Cretaceous Hecate Granite, which crops out 15km west of the northern half of the Sheet area.

The Hecate Granite was formerly mapped as part of the Urannah Igneous Complex, and it occupies a similar structural position on the eastern margin of the batholith as that part of the Urannah Igneous Complex which lies within the Proserpine Sheet area.

Isotopic dating as shown that Lower Cretaceous granite occurs near the contact in the Proserpine Sheet area, just east of the Forestry Station, and it is possible that the granite along the whole of the intrusive contact south of the Forestry Station is also Lower Cretaceous. The area is thickly vegetated, and probably has not been thoroughly prospected.

It is worth considering the possibility that economic deposits of derived gold, similar to those now being investigated along the coast of the Burdekin River delta, may have accumulated in the Quaternary littoral sediments derived from the Proserpine and Andromache Rivers. The Andromache River drains the Mount Hector Goldfield and the eastern half of the Normanby Goldfield, and the drainage basin of the Proserpine River includes the rich Dittmer mine and other gold occurrences west of the Sheet area.

The alluvium of these two rivers, the deltaic deposits of the Bowen-Proserpine Lowland, and the offshore sediments of Repulse Bay are also potentially auriferous. A significant rise in the price of gold would make these environments attractive exploration targets.

Gold and silver were reported to be associated with a basic dyke in the Brandy Creek area, but samples collected by Saint-Smith during an inspection of the prospect contained neither gold nor silver. Morton reported that a supposed gold discovery at Conway Beach consisted of strongly pyritic rhyolite with only a trace of gold and silver.

THE MT. COOLON 1:250 000 SHEET AREA (BMR Report 64)

The Mount Coolon Sheet area has not been an important mineral producer. The only mine of any size is the Mount Coolon gold mine in the north-west, described by Morton. The gold was won from a single lode system contained in a local development of andesites within the Undifferentiated Volcanics. The lode consisted of siliceous rock, developed adjacent to a shear in the andesites away from the shear the siliceous lode graded into silicified andesite. It was apparently an end-product of silicification of the andesite. The lode averaged 7 feet in width and could be traced for half a mile. Gold was bound up with pyrite mineralization and was largely confined to the Siliceous lode. The source of the silicification and mineralization is thought to be a quartz diorite mass which intrudes the andesites and the Anakie Metamorphics to the west.

The lode was discovered in 1913 and was first worked the following year. Operations ceased in February 1939. The total production of gold was about 197 500 oz. Approximately 60 000 oz. of silver were produced after 1930; silver production before 1930 is not recorded.

In 1937-38, the Aerial, Geological and Geophysical Survey of Northern Australia made a geophysical survey of a small area extending south-east from the Mount Coolon mine. This survey used mainly the potential ratio method to search for siliceous lodes in the andesite country rock. Ten zones of low electrical conductivity, probably representing siliceous lodes, were recognized in an area covered by alluvium. The three most interesting zones were tested, but the results were disappointing. No further testing was recommended because of these disappointing results, and because the zones of low conductivity were short and any ore shoots within them would be even shorter.

The Lady Norman mine is a group of shafts and pits south of Eungella, near the eastern edge of the Sheet area. A few parcels of gold ore were won from them in the 1930s but they have been abandoned since.

Part of the Mount Flora Gold and Mineral Field lies within the south-east corner of the Mount Coolon area. This field produced small quantities of copper, silver, and gold in the early part of this century. The mineralization was mainly found in shears or joints in metamorphosed sediments around the Bundarra Granodiorite. The joints are usually at right angles to the granodiorite-sediment contact. They persist into the granodiorite for some distance, but usually are poorly mineralized in the granodiorite.

THE BOWEN 1:250 000 SHEET AREA (BMR Reports 145 & 100)

Gold accounts for most of the mineral production in the area covered in this Report. The gold was produced from numerous small mines which had short productive lives, the most important of which was the Dittmer mine near the eastern edge of the Sheet area. A little silver and copper were also won, mainly from the Dittmer mine. The gold and minor base metal mineralization in the north-east appears to be related to the Lower Cretaceous Hecate Granite, and represents the Mackay metallogenic epoch of Webb`.

All the gold mined in the eastern part of the Sheet area was associated with primary base metal sulphides, and many of the mines, notably those at Normanby, were abandoned because the ores were difficult to treat. The area is considered to have some potential for the discovery of small mesothermal gold and base metal deposits.

Kelsey Creek area.

There are many gold occurrences in the ranges west of Kelsey Creek, including the Dittmer, the most important metalliferous mine in the Sheet area.

The ore at the *Dittmer* mine was unusually rich, and the total recorded production (see Table) is about 55 000 oz of gold, 23 000 oz of silver, and 296 tons of copper from 17 000 tons of ore.

The mine is situated at the head of Kelsey Creek, 52km south-south-east of Bowen. Almost all production came from the Duffer vein, which averages 13 cm in width and is at least 500m long. The vein strikes south-south-west, and has been worked over a length of about 275m, and to an inclined depth of between 150 and 180m. The country rock is fine-grained silicified, epidotized, and pyritized andesite of the Carmila Beds, with subordinate andesite and dacite breccia. The vein crops out close to a boss of diorite, which is possibly a contaminated cupola of the Hecate Granite. The main contact with the Hecate Granite is less than 1km from the mine.

Production began in 1935. Morton estimated that average recovery to the end of 1944 was 5 oz of gold, 2 oz of silver, and 2.5 % copper per ton. By 1947 the reserves of ore became depleted, and in 1948 the mine closed down. The firm was reorganized into a public company with the aim of milling the remaining lower-grade ore and the accumulated dumps. Production resumed in 1949 and continued to 1951, but the venture proved unprofitable, and the company failed to discover further ore. Operations were abandoned in 1952.

An adit (Young Crusader mine) was driven 235m into the hill immediately north of the Dittmer mine, but the Duffer vein, where intersected by the adit, was found to be barren. Three diorite dykes were intersected by the adit.

The Dittmer ore consists of pyrite and chalcopyrite, with subordinate sphalerite, galena, and bournonite, and a trace of pyrrhotite. The pyrite has been partly replaced by the base metal sulphides. The fractured coarse crystals of pyrite contain thin zones which have been recemented by quartz and later sulphides. Most of the chalcopyrite was introduced later, and tends to be aligned parallel to the fracture planes.

Most of the gold occurs as fine grains in the pyrite crystals. The gold content increases in the presence of chalcopyrite, galena, and bournonite. Coarse particles of gold occur only in association with galena and bournonite. Some of the gold was introduced with the pyrite, but some of it was introduced after the pyrite was shattered.

In the 'Lady Denise' area small gold-bearing veins occur along the faulted contacts between andesite roof pendants and granite 1.5km south of the Dittmer No 1 shaft.

RECORDED PRODUCTION FROM DITTMER GOLD MINE

Year	Ore (long tons)	Gold (fine oz)	Silver (oz)	Copper (long tons)
1935	52.76	368.26	219.05	0.89
1936	115.05	700.45	1 06.80	1.13
1937	359.89	2 338.51	869.33	12.42
1938	892.45	4 998.54	2 218.92	26.13
1939	1 393.78	6 370.02	2 927.90	32.17
1940	1 317.53	5 142.06	2 353.73	27.62
1941	1 364.78	7 793.52	3 194.78	45.17
1942	1367.38	6 972.02	3 211.12	35.77
1943	1167.66	5 146.22	2 047.78	25.73
1944	700.17	3 55 3.49	1 702. 77	22.78
1945	981.60	4585.84	2 308.27	30.08
1946	775.54	3 857.74	1762.05	28.12
1947	227.19	1 074.54	456.44	7.55
1948	-	-	-	-
1949	1 920 (dumps)	334.5	-	-
1950	3 906	369.82	31.82	-
1951	585.3	931.41	7.38	-
Total	17 126.78	54 536.94	23418.4	295.56

Auriferous quartz veins in the Carmila Beds were worked in the Happy Valley area north of Dittmer between 1874 and 1909. The main producers were the *Golden Fleece* (260 oz), *Lamington* (about 500 oz), and *Commonwealth* (about 90 oz). As at Dittmer, chalcopyrite was an important ore mineral. Most of the ore was produced from the oxidized zone, and some alluvial gold was won in the early years of the field.

In a report on the *Silver Wattle* claim on the northwest slopes of Mount Quandong, Ridgway noted that the ore shoots in the Dittmer area commonly occur where veins cut porphyry dykes in andesite.

The *Rise and Shine* (or Loch Neigh) mine was located 1km west of the Dittmer mine, on the western slope of a range of hornfelsed Carmila Beds. The auriferous vein was up to 30 cm wide; in 1939 20 oz of gold was produced from 12 tons of ore.

The *Golden Hill* mine was situated in highly indurated arkosic conglomerate about 7km south-east of the Dittmer mine. The conglomerate is intruded by fine-grained diorite and porphyry dykes. The reef contains pyrite, chalcopyrite, and a little sphalerite.

Zimmerman & Branch examined a prospect 400m south of the Dittmer mine, and reported that the granite nearby (Hecate Granite) had an aplitic contact zone rich in pyrite. Gold was found in a vein of green pug in the volcanics, and slugs of gold and molybdenite were found in a gully in the granite close to the contact.

Morton inspected some auriferous veins which had been found in the Hecate Granite, 5km south of Proserpine homestead, but no production is recorded.

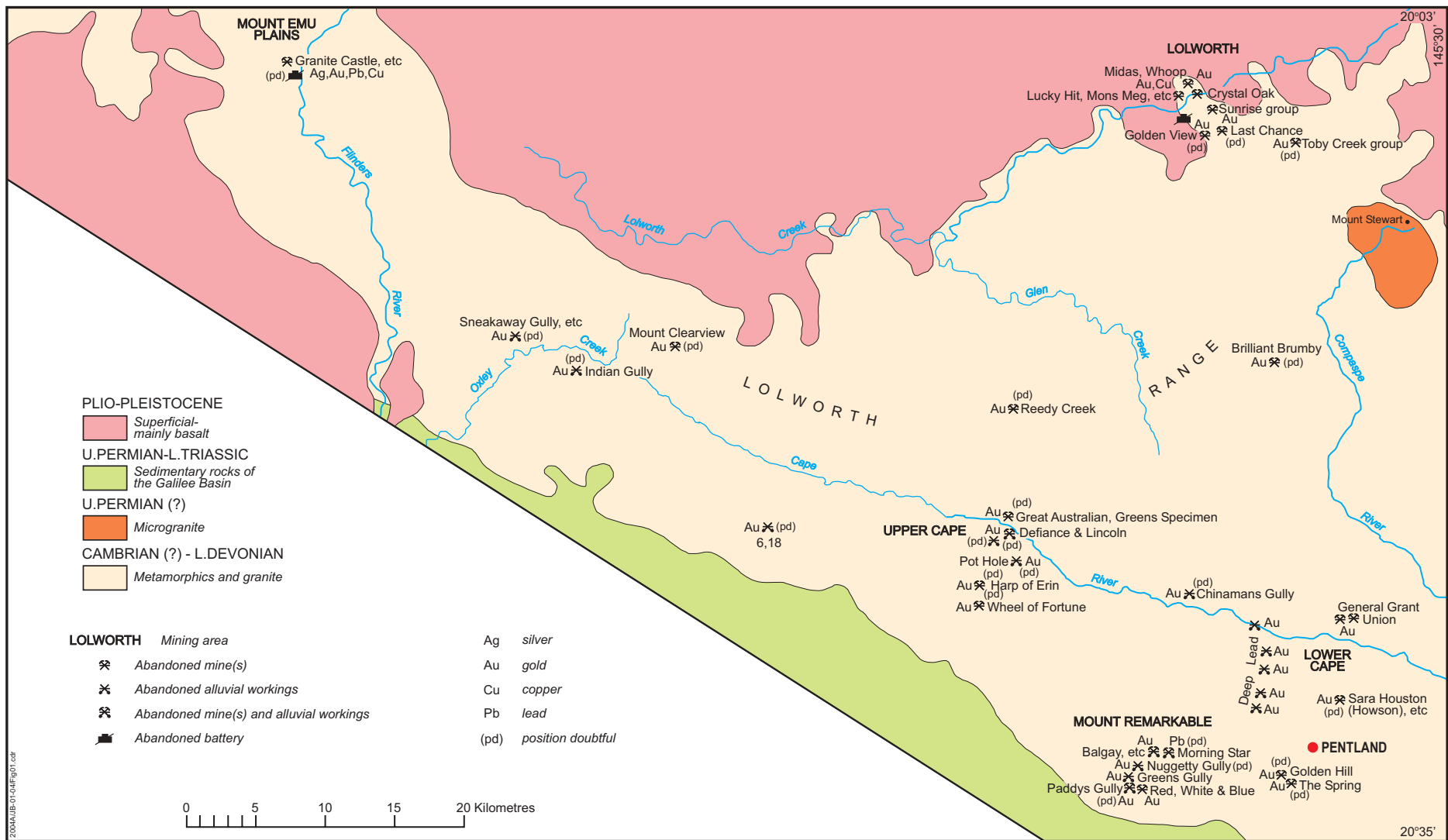
The discovery of the Normanby Goldfield resulted in a short-lived gold rush in the 1870s. There was a revival in 1887, and the population reached 300 in 1891, but owing to the inaccessibility of the field, and the absence of facilities for treating sulphide ore, the mines closed down one by one, and all work ceased in 1908. More auriferous veins were discovered in rugged country east of Grant Creek in 1920. The workings are situated in rugged country in the Clarke Range; Morton accurately described the lie of the land when he wrote 'The whole surface or the country is very much broken, and for miles in any direction it would be difficult to find one acre of level ground'.

The discovery of Normanby before a successful method of extracting gold from sulphide ore had been developed prompted Jack to remark that the field had been discovered too early. The oxidised zone was thin and quickly exhausted, and the dispirited miners left to join the rush to the Palmer River. As early as 1872 some of the mines had been abandoned 'on account of the mundic difficulty'. In the temporary revival in the 1880s and 1890s attempts were made to reclaim the gold by simple amalgamation, but as the gold occurs as fine particles in the sulphides the method proved to be ineffective. The effectiveness of amalgamation was further reduced by the presence of copper, arsenic, and bismuth.

Morton concludes that 'All the evidence goes to show that the reefs did not cut out entirely in depth; in many cases they certainly pinched in size' but 'in other cases the influx of water at the water level proved too much for the means then in vogue of dealing with it'.

Total recorded production to 1906 is about 6000 oz of reef gold and 2000 oz of alluvial gold, but the records, especially of alluvial production, are incomplete. Morton recorded a total of 39 producing mines.

Most of the auriferous veins strike north-west to north-north-west, and dip between 60° and 85° to the north-east; there is a subsidiary series of easterly trending veins dipping north at a high angle. The veins were generally from 15 to 30cm wide with bulges up to 1m; the largest was the Albion, which was commonly 2m thick, swelling in places to 3m. The primary minerals were pyrite, chalcopyrite, galena, and rare sphalerite, arsenopyrite, and bismuthinite. A little secondary



Mines in the Normanby Goldfield and east of Mount Hector

chalcocite was noted by Morton in the Glengarry mine. Bismuthinite at the Grace Darling P.C. contained particles of gold visible under a hand lens.

This mine has the deepest shaft (130m), but few of the other workings on the field went below 30m. The zone of oxidation was thin, averaging less than 15m, and in nearly all cases sulphides were found at the surface. Most of the gold occurred in pyrite of a paler colour than normal.

Diorite is the principal host rock, but some of the veins occur in granite both the granite and diorite are intruded by numerous dykes of fine-grained diorite. The coarse diorite grades into hornblende gabbro and hornblendite, and many of the melanocratic varieties, including the dykes, contain disseminated pyrite.

Morton noted that the auriferous veins are the youngest component of the complex sequence of intrusions, and that most of the veins have the same trend as the north-westerly to north-north-westerly dykes.

The Mount Hector area was the centre of considerable mining activity in the 1930s. Inspections were made by East, Reid, and Ridgway. The Cedar Ridge mine, which was worked between 1932 and 1939 for a total output of 1928 fine oz of gold from 1255 tons of ore, was the largest producer.

Most of the auriferous veins occur in the marginal zone of the Urannah Igneous Complex, and are closely associated with andesite and microdiorite dykes. One of the mines (*Green Bros*) occurs in silicified volcanics (Carmila Beds) near the contact. The veins commonly occupy the same fissures as the dykes. The vein in the Cedar Ridge mine has a footwall of biotite granite (a specimen from the *Gumoller* mine was found to be a trondhjemite - see Urannah Igneous Complex), and a pyritized andesite dyke forms the hanging wall. The vein strikes east-west and dips at between 25° and 30° to the north. The *Gumoller* mine is on the same vein as the Cedar Ridge, but was a much smaller producer. At the *Tiger Rose* mine Ridgway noted that the auriferous vein was displaced by a dyke.

The *Lady Linden* and *Gap* mines are nearer the Normanby mines than the Mount Hector group, but are described in the geologists' reports on the Mount Hector field. The vein in the Lady Linden mine at the head of Birds Nest Creek is bounded by a porphyry dyke on the footwall side, and by granite. Recorded production is 601 oz of gold from 938 tons of ore.

The Marengo Field lies 40 km to the south-west of Bowen. Gold was discovered in 1871, but the field did not flourish. The mines were worked sporadically between 1871 and 1879, but Jack found them virtually deserted. Morton inspected the area 42 years later and found that only one new reef (the *Brilliant*), had been opened up. A mild upsurge of mining activity occurred in the mid-1930s, and Reid was hopeful that the more efficient recovery methods used in the newly established battery would pave the way for successful exploitation of the orebodies. The *Molley* and *Lorna Doone* were the chief producers during this period. The gold-bearing veins contain a small percentage of copper, and the presence of secondary copper minerals in outcrop was used to locate the gold veins. The auriferous veins proved to be too low in grade to sustain mining activity. Total production was probably less than 1000 oz. The Ore Dressing Section of CSIRO reported on the treatment of the ore in 1939.

Several auriferous quartz veins were worked between 1930 and 1935 in the upper reaches of *Eden Lassie (Longford) Creek*. The mines are in the Hecate Granite, the Carmila Beds, and in faults separating the granite from the Upper Carboniferous diorite suite (Cud). Most of the production

came from a southeasterly trending vein system along the faulted contact between the diorite suite and the Hecate Granite. The *Golden Gusher*, *Crazy Cat*, *Anniversary*, and *Lady Ellen* are close to each other on this vein system. The auriferous quartz vein in the Lady Ellen fills a fault between the diorite and adamellite footwall. Production figures for the Golden Gusher are incomplete. Reid states that one crushing of 38 tons yielded 81 oz of gold, and in 1937 he reported that £400 worth of gold (about 90 oz) was won from a shaft 18m deep, next to the underlie shaft of the Golden Gusher. The gold was accompanied by minor silver and copper.

The geology around the Golden Gusher is complex. Thin roof pendants of recrystallised fine-grained diorite in hornblende-biotite adamellite are intruded by numerous dykes of contaminated adamellite. In places the diorite has been converted into gneiss by severe shearing and recrystallization. Both the diorite and adamellite are cut by thin dykes of aplite. The contaminated adamellite dykes are commonly slightly foliated.

The *Birthday Gift* mine was small, but the ore was rich. Recorded production from 1931 to 1935 is 351 tons of ore yielding 606 oz of gold bullion. The auriferous veins occur in greisenized diorite. The greisen was probably formed during the intrusion of the Hecate Granite to the west of the mine. Much of the diorite has been mylonitized and recrystallized, and has been intruded by dykes of sheared and greisenized aplite. The quartz veins are vuggy, and well formed quartz crystals up to 30 cm long have been observed.

At the *Lucky Strike* mine, Wyatt observed lenticular auriferous quartz veins between well defined walls in strongly sheared felsite. Production has been negligible.

At the *Elusive* mine on Mount McGuire, quartz veins containing pyrite, free gold, and bismuth telluride cut dark lavas and pyroclastics. Production is believed to have been small.

Isolated occurrences. Levingston described the *Armistice* prospect, 3km north-west of Mount Dangar. Auriferous quartz veins occur in the sheared margin of a diorite dyke in the Hecate Granite. Only a very small amount of gold was recovered.

Ridgway described the *Welcome* reef in coarse biotite granite 15km south of Bootooloo siding. A diorite dyke forms the hanging wall, and a silicified quartz-feldspar porphyry dyke the footwall. The reef was followed for a length of 15m. Morton also described the copper and gold workings 2.5km south-south-east of Mount Gordon.

Reid reported on the *Pharlap* gold prospect, near the junction of Spring Creek and the Don River, about 10km south-south-east of Pretty Bend homestead. The auriferous quartz vein, which is up to 15cm wide, hugs a thin diorite dyke. A sample from the widest part of the vein assayed 2 oz 4 dwt per ton. This is probably the prospect previously visited by Morton.

A mine known as *Mount Poole* about 20km south-east of Collinsville, is located in altered volcanics and sediments (Lizzie Creek Volcanics) close to the contact with granite and diorite (Ki). The auriferous veins dip to the southwest and northeast at 50° to 90°; one quartz vein occurs in diorite. The veins were rich, but not rich enough to offset the high cost of cartage.

Cribb described a small occurrence of gold 300m east of a graphite deposit about 11km south-south-east of Collinsville.

Low gold values were detected in several thin quartz veins in faulted and steeply dipping altered shale and sandstone. The sediments are intruded by a swarm of thin diorite dykes, and granite crops out 150m to the south of the veins.

Alluvial gold has been discovered from the bed of the Burdekin River at the Falls, but production was small. The main obstacle to successful mining is the presence of large boulders and the highly irregular shape of the bedrock.

There is a group of gold prospects near the head of Millaroo Creek, known locally as Lionel Diggings, but no production has been recorded.

The Mount Wyatt goldfield was one of the earliest known fields in Queensland. The presence of alluvial gold was known in 1868 and was reported on by Daintree. The metalliferous deposits are found in granite or in the metamorphosed sediments around the margins of the intrusions. Small silver and copper lodes are also known in the goldfield but are uneconomic. Mines in the goldfield included the Southern Cross, Golden Ridge, Big Hope, Middle Camp, Top of the Hill, and Big Lode. The Southern Cross mine was the largest. It was opened in 1893 and a battery was erected the following year. Average recovery was reported to be 10.7 dwt per ton, but the reef pinched out, and within a few months the mine closed down. The other mines produced only negligible quantities of gold.

Rutherfords Table is a mesa of Tertiary Suttor Formation overlying granite. The auriferous river gravels occur at the base of the Suttor Formation, in a depression in the granite basement. The gold occurs as small rounded flakes and scales, and as wire gold. The grains range from microscopic size up to 2mm in diameter; fragments up to half a pennyweight have been recorded. Rounding and pitting of the grains suggest they have travelled a considerable distance. Total production during the past 10 years is about 900 oz.

Period	Production (oz)	Main Producers
1878-1900	7696	Normanby, Mount Wyatt
1901-1920	2648	Normanby, Mount Wyatt
1921-1940	391	Normanby, Mount Poole, Urannah
1941-1960	1176	Mount Wyatt, Rutherfords Table
Total	11,911	

Bismuth, arsenic, and gold ores are contained in fissures in granite of the Ukalunda district. The Daisy Bismuth mine, the Walhalla workings, and the Carrington workings are located on fissure lodes. The Daisy is 2 miles north-east of Ukalunda, and the other two are respectively half a mile south and half a mile east of the Daisy.

The almost vertical Daisy fissure was worked over a length of 620 feet and contained two ore-shoots. 250 feet apart. The mine produced ores of gold, copper, silver, and bismuth in 1889 and 1890. The sulphides include chalcopyrite, pyrite, and bismuthinite, quartz and siderite are the main gangue minerals. Morton (1945b) considers that sulphide ores containing high aggregate values of gold, copper, silver, and bismuth remain in the ground.

The Walhalla workings were opened in 1893, but no production was recorded.

In 1936-1938 a shaft was sunk to 125 feet and some ore was sold for its gold content. The work indicated the existence of further gold-bismuth ore, but the ore is complex and successful operation is dependent on the ability to treat the ore locally and recover both the gold and bismuth.

Arsenic-gold ore was mined at the Salopia workings 1½ miles south-east of Ukalunda. The auriferous arsenopyrite occurs sparingly in small quartz veins and as minor disseminations in highly altered Ukalunda Beds close to their contact with an intrusive granite.

THE AYR 1:250 000 SHEET AREA

There is no recorded production of metals. Workings in pyritiferous metarhyolite at the eastern end of the Mount Dalrymple range are possibly old gold prospects.

Pyrite, or its oxidation products, was reported to be widespread, and traces of gold and silver were reported in part of the workings. Occasional vugs carrying lead carbonates with an appreciable silver content and traces of bismuthinite accompanying pyrite were reported from elsewhere in the workings. A sample from one of the shafts assayed 1 dwt 14 gr of gold and 60 dwt of silver. Morton concluded that the low values encountered did not justify further prospecting. However, he stressed the large extent of the greisen, and the possibility of economic mineralization at depth cannot be entirely discounted.

THE CHARTERS TOWERS 1:250 000 SHEET AREA

By far the most important mining centre in the area was Charters Towers - the principal centre of the Charters Towers Gold and Mineral Field. Although production from Charters Towers has been small since the 1920s, its total recorded production since its discovery in 1871 to the end of 1964, except for a small quantity from the Cape River area, was 6,805,510 fine ounces of gold, and until 1959 it had produced more gold than any other mining centre in Queensland. Up to 1916, when practically all mining ceased, 1,000,565 ounces of silver and 3684 tons of lead were also recovered.

All the important mines were located in the Ravenswood Granodiorite Complex. The lodes are simple or composite tabular bodies, wholly or partly within fissures. The fissures belong to two sets of faults which dip to the east-northeast at 27° to 36°, and to the north or north-west at 23° to 50°. The fissure walls are well defined and are commonly slickensided. The lodes are formed of one or more quartz veins separated by crushed and altered country rock. In the major fissures two or more separate veins may occur in parallel or branching channels. Some of them are separated by unaltered country rock and were mined as independent bodies as in the Day Dawn and Brilliant systems.

The ore shoots were irregular in shape and no consistent direction of pitch is apparent. A crude *en echelon* arrangement of the shoots in parallel veins is discernible in places.

The deepest workings were on the Brilliant lode (3000 ft) and on the Day Dawn lode (2700 ft). Only a few of the other lodes were worked below 1000 feet. In all cases values became poorer with depth.

The ore is a simple mesothermal mineral assemblage: the normal primary constituents, in addition to native gold, are quartz, pyrite, galena, and sphalerite. The less common minerals include calcite,

chalcopyrite, gypsum, barite, arsenopyrite, native arsenic, and an unidentified telluride. Galena was important as an indicator of gold values.

The localization of the ore does not appear to have been related to the country rock or to intersection of the lodes either by dykes, early barren quartz veins, or faults (except in the last case for minor local enrichment).

The other important mining centre was Ravenswood, on the Ravenswood Gold and Mineral Field. This also was one of the major gold-producing areas of Queensland, the total yield to the end of 1963 being some 900,000 fine ounces. The field was discovered in 1868, but early development was slow and it was not until between 1898 and 1912 that annual production was consistently high and more than half the total yield was produced.

The main lodes, comprising quartz-sulphide orebodies in fissures in the Ravenswood Granodiorite Complex, were situated in the town area and at Sandy Creek. The Ravenswood field included a number of outside centres, each of which had its own village, around which were grouped several mines. Except perhaps for Brookville, none of these centres was a large producer. They include Kirk, Four Mile, Donnybrook, One Mile (or Totle, mainly silver), Trieste, and Hillsborough (or Eight Mile).

The lodes at Ravenswood itself trend in two principal directions; some trend between north-north-west and north-north-east and dip to the east, and others between north-east and east and dip to the south. The north-trending lodes are more important and numerous. The lodes do not form a network, but rather several groups of north-trending lodes are separated from each other by a few east-trending lodes.

At Sandy Creek, a few miles southeast of Ravenswood, the lodes again trend in two directions. The more important lodes dip south-west, the less important north-west.

In many of the outlying centres the lodes generally have a north to north-westerly or an east to east-north-easterly trend.

Payable ore was obtained to a depth of 700 feet, but only a few of the many lodes were worked below 400 feet. The highly refractory sulphide ores were not amenable to normal battery treatment and this retarded early development. The primary minerals included native gold, galena, chalcopyrite, sphalerite, pyrite, quartz, and possibly calcite.

The various mines on the field have been described by Maclaren, Cameron, and Reid.

Other gold occurrences in the Ravenswood Granodiorite Complex occur south-east, south, and south-west of Charters Towers. None was a big producer, but among the more important were Broughton, Rishton, Dregghorn, St Pauls, Lighthouse, Windsor, and Southern Cross. Many are described by Marks.

A little gold has been produced from the Old Homestead diggings, 7 to 12 miles north of Homestead and from the Big Hit mine. In both cases the mineralization is probably related to the Lolworth Igneous Complex.

Gold has also been found in the Cape River Beds and Mount Windsor Volcanics: gold was worked at the New Homestead diggings south-east of Thalanga siding late last century; at

Liontown in the early 1900s; and at the Highway mine in the 1950s. Numerous old shallow workings, about which little is known, occur between Britannia homestead and the Gregory Developmental Road. They are the result of gold mining and prospecting activities earlier this century; some may be the result of work during the depression years of the 1930s. None of the deposits in the Cape River Beds has been a large producer.

Gold has been mined in volcanic rocks which postdate the Ravenswood Granodiorite Complex at Mount Leyshon and Mount Wright. At Mount Leyshon the gold occurs in rhyolite and dacite agglomerate (Pzo) in an old volcanic vent at the contact between the Ravenswood Granodiorite Complex and the Cape River Beds. The gold is disseminated throughout the rock, or occurs in association with thin limonite veins and stringers which permeate the country rock. Values are erratic. Other primary minerals include pyrite and chalcopyrite.

Production from 1887 to 1946 was about 38,000 fine ounces of gold from about 208,000 tons of ore. At Mount Wright deposits occur in a hydrothermally altered breccia pipe (Cur). The breccia consists mainly of biotite granite, but it also contains pieces of fine-grained volcanics or dyke rocks. The lode consists of an ill defined zone irregularly impregnated with pyrite and sphalerite, with traces of copper and arsenic. Siderite also occurs in both auriferous and non-auriferous sections. Production figures are incomplete, but approximately 1300 fine ounces of gold were produced.

Small quantities of gold have also been worked from deep leads at the base of Tertiary sediments forming Little Red Bluff, and the Puzzler Walls.

THE TOWNSVILLE 1:250 000 SHEET AREA

Part of the Townsville Sheet area is included in the Charters Towers and Ravenswood Gold and Mineral Fields, but gold production has been small. The main mining centres and types of deposits are listed.

The Grass Hut and Fanning deposits, like those of Charters Towers and Ravenswood, are associated with the Ravenswood Granodiorite Complex. In the other centres, the gold mineralization appears to be related to late Palaeozoic intrusives in Devonian sediments.

Gold is also known to occur at Bunkers Hill (Ravenswood Granodiorite Complex and Kirk River Beds), Horse Camp Creek (Ravenswood Granodiorite Complex), Mount Squarepost and Magnetic Island (uppermost Carboniferous granite), Mount Elliot (Lower Permian granite), Ponto (Argentine Metamorphics), and Six Mile or Argentine Extended (uppermost Carboniferous granodiorite).

Total production of gold in the Sheet area has been low, but returns separate from those for the Ravenswood and Charters Towers Fields are not available.

SUMMARY OF GOLD MINING AREAS

Mining Centre	Mines	Country Rock	Mineralising agent	Type of deposit	Associated minerals	Main Production years
Piccadilly	Piccadilly P.C. Piccadilly No.1W	U. Devonian sandstone and shale (Dud)	?	Quartz reef	Pyrite	1894-1909
Far Fanning	Several mines on three main lines of lode	U. Devonian sediments (Dud) and late Palaeozoic porphyry (not shown on map)	Late Palaeozoic porphyry(?) (C-Ph)	(a) Quartz leaders in steeply dipping felsite dykes (b) Gently dipping stockworks	Pyrite, arsenopyrite and rare chalcopyrite	1895-1908
Mount Success	Mount Success	Porphyry (C-Ph) and Fanning River Group	Late Palaeozoic porphyry of Mount Success (C-Ph)	Contact replacement	Pyrite and sphalerite	1895-1906
Golden Valley	Golden Valley P.C. Golden Valley Block Golden Valley No.1E Golden Valley No.1W Golden Valley No.2W	Felsite (C-Ph) and Ravenswood Granodiorite Complex	Late Palaeozoic porphyries and felsite of Mount Success (C-Ph)	Quartz reef with felsite hanging wall and granite footwall	Pyrite and sphalerite	1898-1907 1922-1934
Grass Hut	Numerous mines on several lodes	Ravenswood Granodiorite Complex	Late acid phase of batholith	Quartz reefs in fissures(?)		1887-1895
Fanning/ Salas siding	Numerous mines on several lodes	Ravenswood Granodiorite Complex	Late acid phase of batholith	(a) Quartz reefs in fissure, e.g. Rose of Allandale (b) Pipe-like body of greisenised granodiorite e.g. Welcome	Pyrite, galena, sphalerite, argentiferous tetrahedrite, and chalcopyrite	1890-1900 some revival 1930-1940