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BILLITON AUSTRALIA

AUREOLE N.L.
AMERICAN HORIZON RESOURCES, INC.
FEDERATION RESOURCES N.L.

E.L. 58/88 - GOLDEN RIDGE JOINT VENTURE

Annual Exploration Report for the Period 7th April 1990 to 7th April 1991

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Report No : 08.5292

Date : Feb. 1991

Copy No : 1

Distribution:
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3. American Horizon Resources Inc.
4. Federation Resources N.L.
5. Billiton Australia, Melbourne
6. Billiton Australia, Devonport

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1. INTRODUCTION

This report summarizes the results of exploration carried out by Billiton Australia on behalf of the Golden Ridge Joint Venture since April 1990.

Exploration completed in the first year of tenure is presented in Billiton report 08.4946.

2. LOCATION & ACCESS

The licence is situated in the north-east of Tasmania approximately 20kms west of St. Helens and 70kms east of Launceston. (Fig 1). Access to the tenements is obtained via well maintained Forestry roads (eg Hogans Road) and thence by tracks in varying states of disrepair.

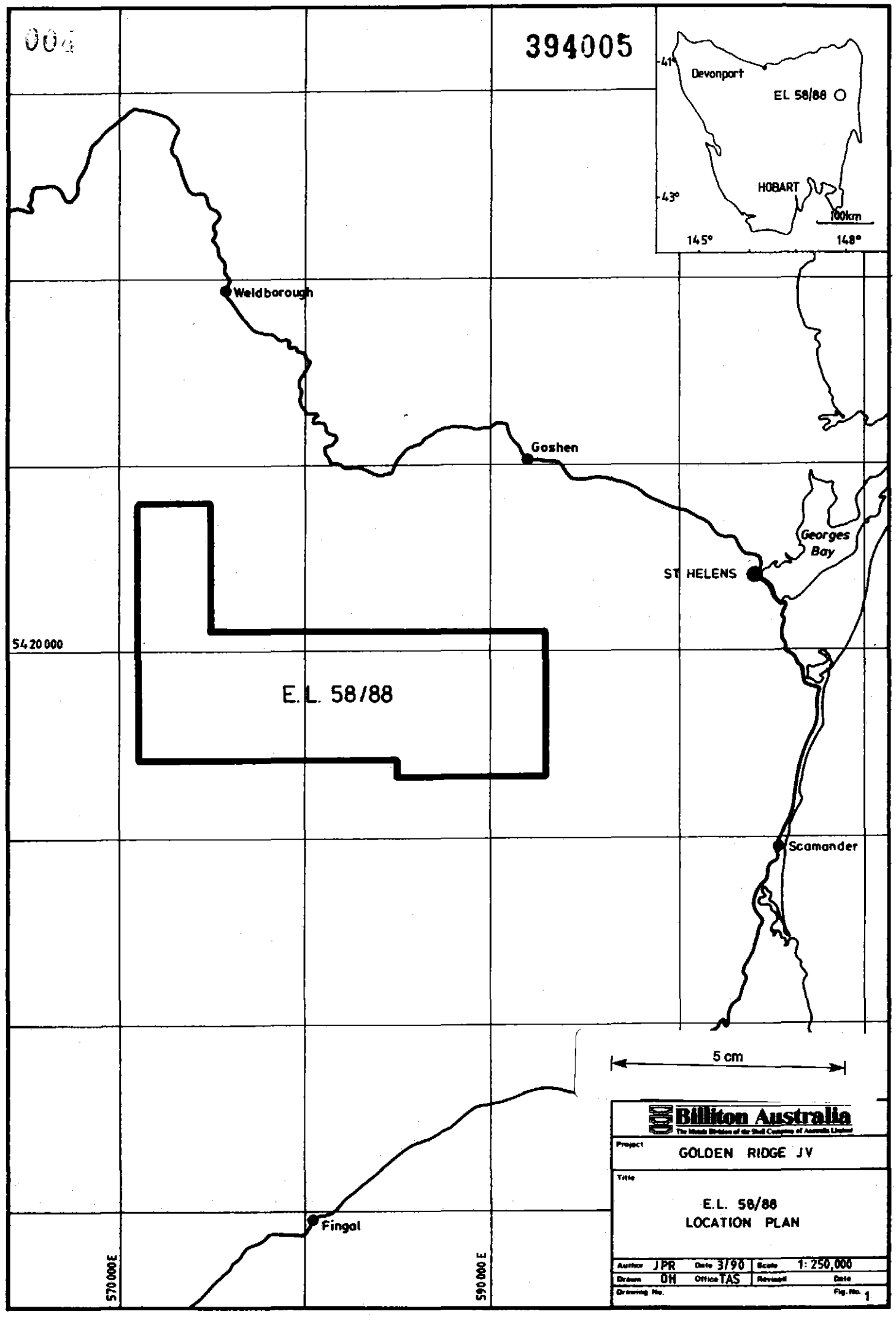
The topography is steep with numerous linear spines and deep gullies. Vegetation consists of dry sclerophyll forest, eucalypt regeneration and pine plantations.

3. LAND TENURE

Exploration licence 58/88, of 189km², was granted on 7th April 1989 to a consortium consisting of:

Federation Resources N.L.	20% equity
American Horizon Resources Inc.	30% equity
Aureole N.L.	50% equity

Aureole N.L. was elected operator of this group.


004
394005
41°
Devonport
EL 58/88
43°
HOBART
100km
145°
148°
Weldborough
Goshen
Georges Bay
ST HELENS
5420000
E.L. 58/88
Scamander
5 cm
Fingal
570000E
590000E
Billiton Australia
The Metals Division of the Shell Company of Australia Limited
Project
GOLDEN RIDGE JV
Title
E.L. 58/88
LOCATION PLAN
Author JPR
Date 3/90
Scale 1: 250,000
Drawn OH
Office TAS
Revised
Date
Drawing No.
Fig. No. 1

The Shell Company of Australia Ltd., through its subsidiary Billiton Australia, farmed into the project on 9th October 1989 as manager of the joint venture.

Within the tenement, mining lease 43M/88 (100ha, Oceania Tas P/L) is current and is included within the joint venture (Fig 2).

4. REGIONAL SETTING

The licence covers the southern ends of the Pyengana and Poimena Plutons (biotite-hornblende granodiorite and granite) of Upper Devonian age that have intruded Siluro-Devonian Mathinna Beds sediments (see Fig 3). Around the margins of these plutons, a contact metamorphic zone characterized by moderate hornfelsing of the sediments occurs as a band up to 1km wide.

A mineralization zonation is well known in the Scamander area and from east to west a gradation from Cu-Pb to Sn-W to Au-As is noted. The Golden Ridge locality defines this latter category and is represented by numerous shafts, adits and pits over a 4km strike length wrapping around the margin of the Poimena Pluton.

Throughout the North-East Province there is good evidence of a strong structural control to the emplacement and grade of the auriferous mineralization. At both regional and local scales a

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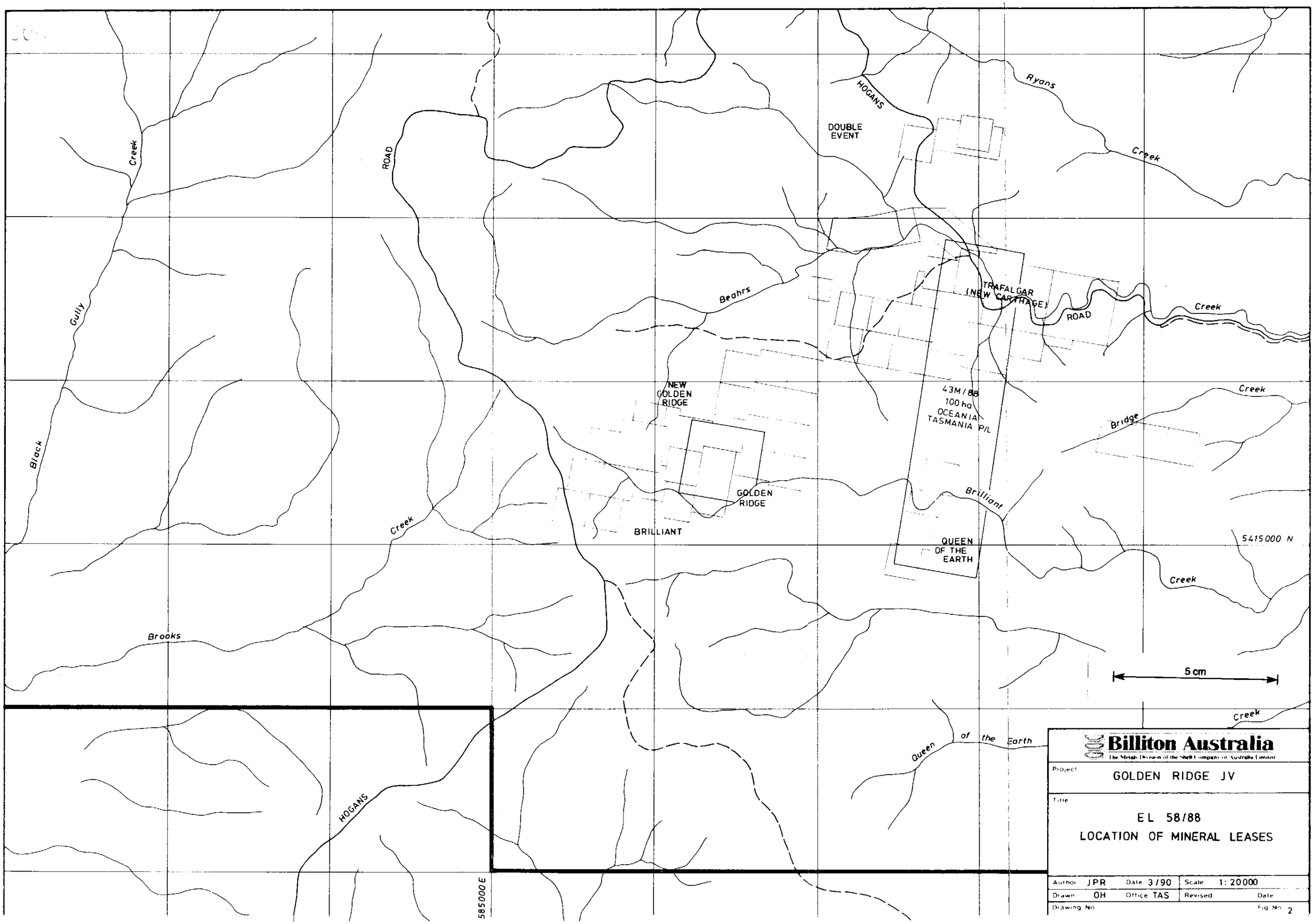

Billiton Australia
The Metals Division of the Shell Companies of Australia Limited

Project: GOLDEN RIDGE JV

Title:

EL 58/88
LOCATION OF MINERAL LEASES

Author JPR	Date 3/90	Scale 1:20000	
Drawn OH	Office TAS	Revised	Date
Drawing No.			Fig. No. 2

394008

570000 E
580000 E
590000 E
600000 E
5430000 N
5420000N
5410000 N

TASMAN HIGHWAY
ST HELENS

EL 58/88
ML 43M/88

Sm
P
J
Dg_1
Dg_2
Dg_3
MT VICTORIA
PYENGANA PLUTON
POIMENA PLUTON
Double Event
Trafalgar
New Carthage
Golden Ridge
Brilliant
Queen of the Earth

MATHINNA ROAD
EVERCREECH ROAD
HOGANS ROAD
MATHINNA

J Jurassic Dolerite
P Permian Sandstone, Shale
Sm Siluro Devonian Mathinna Beds

Upper Devonian Granitoids
Dg_1 Biotite Hornblende Granodiorite
Dg_2 Biotite Granodiorite
Dg_3 Biotite Granite

5 cm

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: GOLDEN RIDGE JV
TRAFALGAR OPTION

Title:
ML 43M/88 & E.L. 58/88
REGIONAL SETTING

Author JPR	Date 3/90	Scale 1:100,000	
Drawn OH	Office TAS	Revised	Date
Drawing No.			Fig No. 3

favoured NNW-SSE orientation is evidently the major directional control and this can be identified on all scales from Landsat imagery analysis to "walking the outcrop".

5. PREVIOUS EXPLORATION

The licence area was previously held as EL 24/82 by Oceania Tasmania but very little exploration has been carried out or at least reported. Their work appeared to be limited to minor rock chip and soil sampling around the old workings but no systematic work is evident.

Union Corporation (Aust) Pty. Ltd. carried out some stream sediment sampling within EL 21/80 during 1981 but apparently analysed the samples for Sn, W, Mo, Cu, Pb, Zn only.

Texins Development Pty. Ltd. through Geophoto Resources Consultants also completed a stream sediment survey with some follow up rock chip and soil sampling.

Other recorded work within the area relates to the initial mining activity surrounding the Hogans Track or Brilliant Creek Goldfields viz.

"Report on the Queen of the Earth Gold Mine and Neighbourhood" by W.H. Twelvetrees, 1900.

"Report on Gold Mines near Hogans Track". by W.H. Twelvetrees, 1899.

"Notes on the Trafalgar Leases - Upper Scamander District". by

Q.J. Henderson, 1935.

"Report on the Geological Survey of the Country between Scamander and Mathinna". by Q.J. Henderson, 1939.

Unnamed Report by Q.J. Henderson, 1935.

Exploration completed by Billiton from 1989-90 has included rock chip sampling, stream sediment sampling and initial reconnaissance around the area of the Brilliant Creek Goldfield.

6. MINERALIZATION

Within the tenement, several groups of workings occur that were prospected during the turn of the century for gold. The location of these workings is shown in Figure 2 and comments pertaining to each are presented below.

The New Carthage-Trafalgar workings occupy an area of 200m x 120m and are located on the margin of and within a granodiorite plug. They occur on the crest and flanks of a north south trending ridge and are typified by numerous small pits with larger shafts and small costeans. One adit of 25m length has been dug. The Trafalgar workings consist of 3 shafts only and although reasonably large, no access ways are evident.

Where observed the mineralization style is characterized by thin (5-10cm) quartz lodes of variable orientation but it is apparent from the distribution of pits and costeans that the style is overall one of broad anastomosing quartz veins in a stockwork pattern.

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The Queen of the Earth workings are dominated by extensive exploitation of a ~0.5m wide quartz vein over a strike length of 70-80m. Underground examination was not possible to any great degree both due to blockages in the main adit and unsafe stopes. These workings are located ~1.5km south of the Trafalgar-New Carthage occurrences and are interpreted to be structurally related. On Golden Ridge itself, numerous small pits occur and these line up with the named workings.

Along the crest of Golden Ridge are situated 3 groups of workings viz. Golden Ridge, New Golden Ridge and Brilliant. Between these workings are scattered numerous small pits over an area of 1.5km x 200m. Examination of material from these pits indicated the presence of a fine anastomosing quartz veinlet system within Mathinna Beds micaceous silts and sands.

The Golden Ridge workings themselves are centred on this area of scattered pits and consist of a single shaft and several costeans.

The New Golden Ridge and Brilliant workings occur along the same structural feature and are separated by a distance of 150m. At New Golden Ridge, two subparallel quartz veins (5-7cm width) are separated by 20m of sandy sediments that show a variable content of fine quartz veinlets in a stockwork arrangement. Evidence of mineralization occurs over a strike length of 70m.

The Brilliant workings consist of 2 adits that enable access to a ballroom of dimensions 26m x 15m. Numerous small headings have been developed with the aim of following thin ferruginous shears some of which contain thin quartz veinlets. The orientation of these shears is in several directions giving the impression of a wide stockwork system.

The Double Event workings were not located despite several attempts to find them amongst the thick scrub.

7. EXPLORATION COMPLETED 1990-91

Exploration during this period focused on the area of known mineralization mainly, although some regional work was completed. Details of this work are summarized below:

- Stream Sediment Sampling: a total of 249 samples were collected from streams draining Mathinna Beds sediments and Devonian granite margins. Sample sites were selected in the planning phase to give a coverage of 1 sample per 1-2km^2. At chosen sites samples were collected from active zones within the flow regime and a bulk sample (5-7kg wet) sieved to -1/4" collected in toto in large plastic bags. Samples were assayed for Au by the Bulk Leach Extractable Gold (BLEG) technique at Classic Laboratories, Adelaide.

The programme was carried out in two phases: an initial phase of 157 samples (18001-157) and a secondary follow up phase of anomalous sites (92 samples, 19201-288 + 18553-56). Results are presented in Appendix 1.

- Costeaning: a total of 10 costeans (total length 598m) were dug to a depth not greater than 2 metres by a tracked Kato excavator. Where possible, top soil was separated from the underlying weathered rock and clay. All costeans were geologically mapped and sampled either at 2-4 metre intervals or according to geological boundaries. Subsequently, several phases of sampling were carried out to verify earlier results. A summary of the sampling phases is presented below:

Costean	Location	Sample Nos.
1	Brilliant	18301- 22 original
		19101- 13 duplicates
2,2A	Brilliant	18323- 53 original
		19114- 26 duplicates
3	Brilliant	18354- 78 original
		19127- 47 duplicates
4	Brilliant	18379- 98 original
		19148- 59 duplicates
5	Brilliant	18399-413 original
		19160- 63 duplicates
6	Ridge Top	18414- 30
7	Ridge Top	18431- 55
8	Golden Ridge	18456-500
8A	Golden Ridge	18511- 20
9	Golden Ridge	18501- 10
10	Brilliant	18521- 52 original
		19164- 69 duplicates

In addition, splits from originals and duplicates were taken and re-assayed at both Classic Laboratories, Adelaide and Analabs, Burnie. A fire assay with 50gm charge was carried out at both laboratories to analyse gold content only. As was determined for the original costean samples only. A suite of samples was also collected (16959-71) from selected portions of the costeans to determine the likely repository of gold mineralization. All geochemical results are presented in Appendix 1.

- Gridding: Two gridding phases were completed in the vicinity of Golden Ridge itself. The initial phase (10kms) was completed in the area surrounding the Brilliant-New Golden Ridge workings. Lines were spaced 50-100m apart with pegs every 20 metres and an AMG co-ordinate system was used. The second phase (27.7kms) extended this grid to the east along Golden Ridge covering the granite contact, hornfelsed Mathinna Beds and remaining workings of the Brilliant Creek Goldfield. A cut grid was also constructed around the perimeter of ML 43M/88. A 1:5000 enlargement of the 1:25,000 Brilliant Topo sheet was used as a base for future work. (Fig 4).

- Geological Mapping: The initial grid at Brilliant was mapped in detail and a total of 55 rock chip samples collected for analysis of Au by fire assay. (16972-17000, 19301-26). Results are reported in Appendix 1.

- Composite Soil Sampling: Three surveys were carried out within the vicinity of Golden Ridge itself. The first was designed as an orientation and consisted of collecting the -1/4" fraction of soil at 5m intervals and compositing the sour sub samples into a single 20m bulk of approximately 2kg. This programme was completed along the crest of Golden Ridge from the Brilliant to Trafalgar-Queen of the Earth line of workings (samples 18201-80).

  The second survey resulted in the complete coverage of the Brilliant grid by a total of 147 forty metre bulked samples composited from 4 x 10m spaced -1/4" soil sub samples. (Samples 18901-965, 19001-082).

  The final survey extended the previous grid coverage to the east through ML 43M/88. A total of 586 samples (19701-13, 19715-27, 19729-41, 19743-55, 19757-925, 19927-20292) were collected in a similar manner as the second survey.

  Samples from all three surveys were collected as 2kg composites and despatched to Classic Laboratories, Adelaide where a BLEG Au analysis was completed. All results from this work are included in Appendix 1.

- C.O.D.E.S. Research: The Centre for Ore Deposit and Exploration Studies at the University of Tasmania have allocated two research workers to uncover the local structural and geochemical controls on mineralization within the Golden Ridge area. Work to date has included:

a) Structural mapping in the vicinity of the workings.

b) Sampling of granites (11 samples) to determine silicate trends.

c) Sampling of mineralization to determine geochemical traits.

d) Limited fluid inclusion work at Trafalgar.

e) Gravity surveying and interpretation across the Golden Ridge granitoid (3 lines, 49 stations).

f) Sampling of litho-types (12 samples) for physical property measurements.

g) Aero-magnetic interpretation of Dept. Mines data.

A full report detailing this research is included as Appendix 2.

- Consultant Report: A geological consultant with experience in thermal aureole gold mineralization was engaged to look at Golden Ridge as part of a broader review.

8. EXPLORATION RESULTS

8.1 BLEG Stream Sediment Survey

A BLEG stream sediment survey (157 samples, see Fig 5) was completed over the entire exploration licence using a sample density of one sample per 1-2km^2. Results were collated and a basic statistical treatment applied from which the following statistics were derived:

viz

No. of samples	=	157
Background value	=	1ppb Au
Mildly Anomalous value	=	>1.4ppb Au
Strongly Anomalous value	=	>2.5ppb Au

Using these cut-offs, several areas were recognized as warranting follow up sampling. (see Fig 6).

viz

1. Queen of the Earth Creek - max BLEG 4.2ppb Au.
   - drains an area of fine quartz veining within Mathinna Beds.

2. Horrible Hollow Gully - max BLEG 2.0ppb Au.
   - occurs within the contact aureole east of Golden Ridge .

3. Bridge Creek - max BLEG 2.5ppb Au.
   - similar setting to above.

4. Risky Ridge - max BLEG 2.2ppb Au.
   - drains an enclave of Mathinna Beds within the Poimena Pluton.

5. Golden Ridge-Trafalgar Flat - max BLEG 1.6ppb Au.
   - occurs downslope of Brilliant workings.

6. Ryans Creek - max BLEG 1.40ppb Au.
   - within contact aureole east of Double Event.

7. Evercreech Rivulet - max BLEG 7.5ppb Au.
   - drains contact aureole 4kms west of Golden Ridge.

8. Back Gully Creek - max BLEG 6.5ppb Au.
   - similar setting to above.

A follow up BLEG stream sediment survey (92 samples) was completed and samples despatched for analysis. Results are summarized below:

Anomaly	Original BLEG (ppb Au)	Follow up BLEG (ppb Au)	Action
Back Gully Ck	6.5	duplicate 4.5 max upstream 40	Field Reconn. (Priority 1)
Evercreech Rivulet	7.5	duplicate 0.5 max upstream 0.6	No follow up
Risky Ridge	2.2	duplicate 3.3 max upstream 22.7	Field Reconn. (Priority 1)
Ryans Creek	1.4	duplicate 0.3 max upstream 8.0	Field Reconn. (Priority 2)

Bridge Creek	2.5	duplicate 0.45 max upstream 0.25	No follow up
Horrible Hollow Gully	2.0	duplicate 2.2 max upstream 0.25	No follow up
Queen of the Earth Creek	4.2	duplicate 3.1 max upstream 6.5	Field Reconn. (Priority 2)
Golden Ridge-Trafalgar	2.1	duplicate 4.9 max upstream 11	Detailed evaluation underway

The lack of agreement between original and duplicate samples from the same sites is of concern in terms of the reliability of the method in terrains of seasonal high stream flow. Two of the eight anomalous drainages produced assays that were an order of magnitude less when repeated and furthermore, sampling upstream failed to indicate any anomalism. One may suspect sampler error (incorrect sample point, poorly selected sample site) or laboratory error (contamination, incorrect calculation, poor mixing of CN solution) as possible causes for this poor agreement.

Of the four remaining areas recommended for follow up (viz Back Gully Creek, Risky Ridge, Ryans Creek, Queen of the Earth Creek) only the former has been investigated. In this case, further sampling up stream (samples 18553-56) failed to produce anomalous results and no evidence for the anomalous value was observed (viz alteration, quartz vein -ing, ferruginization, shearing).

8.2 Costeaning

A costeaning programme was completed over the New Golden Ridge - Brilliant (6 costeans) and Golden Ridge (4 costeans) workings. (Fig 7). The costeans have been geologically mapped and several phases of sampling have been completed (all fire assayed analyses):

1. 2-3kg composite chip samples, analysed by Analabs.
2. Re-splits of 1. above, analysed by Analabs.
3. Duplicate 4-5kg continuous chip samples, analysed by Analabs.
4. Splits of 3. above, analysed by Classic.
5. Selective chip sampling of ferruginous quartz veins and host sediments.

A summary of the geological and geochemical results is presented below and in Figures 8, 9, 10.

Costean	Geological Result	Geochemical Result
1	1. 14m wide zone of fine ferruginous quartz veinlets within carbonatized fine sandstone. 2. 3m wide zone as above	1. 18m @ 1.24gt Au (1.43 gt Au resplit) using a 0.5gt Au cut off. Values range from 0.54-6.18gtAu 2. 3m @ 1.19gt Au.
2,2A	16m wide zone of ferruginous quartz veinlets & pods in a massive siltstone/sandstone.	Anomalous levels of Au (0.03-0.9gt Au) along entire costean. One zone of 8m @ 0.81gt Au.
3	30m wide irregularly developed zone of fine ferruginous veinlets in variably silicified siltstones.	34.5m @ 1.37gt Au (1.25 gt Au resplit) using a 0.5gt Au cut off.

4	1. 6m wide zone of fine ferruginous fractures in a silicified sandstone. 2. 8m wide zone of irregular ferruginous quartz veinlets & pods in variably silicified sandstone.	Anomalous levels of Au (0.01-0.5gt Au) along entire costean.
5	6m wide zone of very weak ferruginous veinlets in silicified sandstones.	Anomalous but very low (0.02-01gt Au) levels of mineralization.
6	Non mineralized poorly silicified spotted hornfelsed sandstone.	Non anomalous values.
7	8m wide zone of weakly ferruginous veinlets in moderately silicified sandstone.	Non anomalous values.
8,8A	24m wide zone of fine ferruginous quartz veinlets in carbonatized silicified sandstone.	Generally non-anomalous but with local spot highs to 0.8gt Au.
9	12m wide zone of fine ferruginous quartz veinlets & pods in micaceous sandstone.	Mildly anomalous (0.02-0.13gt Au) values only.
10	50m wide zone of intensely silicified & carbonatized siltstone including an 8m & 20m wide zone of fine ferruginous veining.	6m @ 1.12gt Au (0.95gt Au resplit) within a broad anomalous zone (0.02-0.4gt Au) along entire costean.

Costeans 1, 2, 2A, 3, 4, 5, 10 were constructed at New Golden Ridge-Brilliant (see Fig 11) while the remainder (6, 7, 8, 8A, 9) are located at Golden Ridge.

Mapping of the costeans indicated that the dominant lithology is a fine generally non laminated siltstone with subordinate fine sandstones and spotted hornfelsed sediments. Mineralization is better developed in the sandy lithologies as fine ferruginous stockworks with or without

quartz. However, the higher grade samples are associated with either sheeted quartz veinlets or fine quartz vein stockworks. White bulbous quartz veins appear to be largely barren.

The various sampling phases demonstrated the irregular distribution and probable coarse nature of at least some of the gold mineralization. This can be easily demonstrated by reference to the following table.

Sample	Original Composite Chip	Split of Original	Duplicate - Analabs	Duplicate - Classic
18305	0.578	0.554	2.77	3.75gt Au
18306	1.798	1.310	1.02	0.68gt Au
18312	0.596	0.820	1.305	1.04gt Au
18318	4.650	6.180	2.010	0.76gt Au
18357	6.130	2.450	1.452	1.48gt Au
18368	0.465	0.584	1.216	0.66gt Au

Detailed re-mapping of the costeans confirmed the results of mapping completed by Garry Davidson of C.O.D.E.S. Tas. Uni. viz stratigraphy is essentially flat lying to shallow with gentle folding prominent. This has important ramifications for the potential of large tonnage mineralization at Golden Ridge in that, if the mineralization is stratabound then a large surface area of potential mineralized stratigraphy is present at approximately the same R.L. below surface. This premise would account for the presence of wide zones of anomalous geochemistry observed in the costeans i.e. each costean has sampled the same or a similar stratigraphic level rather than providing a cross section of

stratigraphy. The occurrence of high grade narrow quartz lodes with steep dips is most probably reflecting a later remobilization and reconcentration of mineralization into local shears, located at zones of weakness (fold hinges?).

8.3 Geological Mapping

Detailed mapping and rock chip sampling was completed over the Brilliant-New Golden Ridge grid (see Fig 12).

The mapping indicated a broad zonation away from the Poimena granite indicative of a contact metamorphic aureole. The zonation can be idealized as follows:

Granite.

Coarse spotted hornfels

Banded ± spotted hornfels — up to 250m from granite

Massive quartzite - 300m to 325m from granite

Silicified sandstone

Mixed sediments, variably silicified and spotted - present up to at least 800m from granite.

Non altered sediments

Bedding attitudes infer a gently folded sequence of sediments with fold axes trending 345°-045° Mag. Dips are flat to shallow to the east and west. Numerous fine sheeted quartz vein systems were mapped within the more strongly hornfelsed sediments and indicate a structural pattern with

strike attitudes of 010°-045° Mag. This is consistent with general trends of workings and creeks, suggesting concentration in this lithology. The stratabound character of the mineralization, while not proven, is certainly indicated from the mapping of both costeans and surface outcrop.

Rock chip sampling of selected altered ferruginous and quartz veined rocks indicated marginal anomalism from an area 250m west of the main New Golden Ridge-Brilliant workings. A small gouging has exposed a narrow shear zone in silicified sediments in which a thick quartz vein occurs. The mineralization appears to be limited in extent and no further work is planned.

8.4 BLEG Composite Soil Sampling

A composite BLEG soil sampling programme has been completed over a gridded area surrounding the New Golden Ridge-Brilliant workings. (Fig 13). A total of 147 samples were collected by compositing 10m spaced samples into 40m spaced composites. Results have been statistically treated and suggest the following thresholds, viz

Background	<16ppb Au
Mildly Anomalous	+34ppb Au
Strongly Anomalous	+63ppb Au

Contouring of results indicates three areas of interest (Fig 14):

- The Old Workings: a peak response of 300ppb Au is incorporated within a 300mx120m zone defined by the +10ppb Au isopleth.

- North West Shear Zone: a small 100m square zone defined by the +10ppb Au isopleth with peak value of 50ppb Au.

- South West Breccia Zone: an elongate marginally anomalous zone of dimensions 200mx50m defined by the +10ppb Au isopleth. A peak value of 20ppb Au occurs.

Of most interest is the anomaly surrounding the old workings. Here the peak values correspond with extensions of broad mineralization intersected in costean 3 (viz 34.5m @ 1.37gt Au). The areal extent of the anomaly is however disappointing as it merely confirms the extent of mineralization exploited in existing workings.

The programme was completed in view of the orientation survey success along the crest of Golden Ridge where anomalous zones corresponded with known mineralization. It was therefore logical to extend the grid eastwards to cover the most prospective aureole margins (see Fig 15) and to continue soil sampling.

The results of this programme were plotted onto the 1:5000 base plan overlay (Fig 16) and five areas of anomalous geochemistry were evident (see Figs 17,18).

1. New Carthage-Trafalgar: an area of 400m x 300m contains anomalous values (>9ppb Au) with maximum value of 110ppb Au. The anomalous zone includes the known workings but also extends north along the granitoid contact across Hogans Road. The anomalous zone is not regular but may consist of several subparallel zones.

2. 416000N 588000E: a linear anomaly of dimensions 250m x 75m with maximum BLEG Au 22ppb. This zone trends NNE and is along strike from the eastern anomaly at New Carthage.

3. 415800N 587500E: a broad low tenor anomaly 500m x 250m that straddles the granitoid - sediment contact. Maximum value is 26ppb Au.

4. 415500N 587500E: a similar anomaly to above in shape 700m x 200m but also incorporates a higher grade eastern end that is along strike from the New Carthage and 416000N 588000E anomalies. Maximum value of 50ppb Au was recorded here.

Note that the Queen of the Earth reef is not effectively delineated by the BLEG soil survey. A single sample of 39ppb Au is the only anomalous response.

394026

5. Golden Ridge: a weak anomaly of dimensions 200m x 200m with maximum response 100ppb Au down slope from the workings.

No follow up of these anomalous zones has been carried out to date and hence the source of the less obvious anomalies has not been determined.

8.5 C.O.D.E.S. Research

A complete account of results to date are appended with this report but listed below are several salient points that relate to the exploration potential of the licence.

1. The Golden Ridge granitoid is compositionally distinct from the Pyengana Granodiorite and the Poimena Adamellite. Harker scatter diagrams show distinct variations in MgO vs FeO, CaO vs FeO, Nb vs Zr and MgO vs Zr for the three plutons.

The inference from this observation is that gold mineralization at Golden Ridge may be genetically related to a geochemically distinct granitoid.

2. Intrusion of the Golden Ridge granitoid resulted in dextral wrenching of the Mathinna Beds from the regional N to NNW fold trend to ENE trends. This may imply a relatively slow emplacement of the pluton.

3. The inner thermal aureole (cordierite and andalusite spotting) extends up to 1300m from the granite contact at surface. This observation broadly agrees with that made by consultant Jeff Taylor on his recent tour through the NE. However, that author was of the opinion that the outer biotite - grade aureole was laterally very extensive from Golden Ridge to Mathinna. This is supported by Mike Roach's gravity work.

4. Gravity profiling suggests that the newly defined Golden Ridge granitoid extends much further west than originally suggested by the 1:50,000 map. It is now felt that the western boundary may lie in the vicinity of Evercreech Rivulet.

5. The gravity derived dip of the southern margin of the Golden Ridge granitoid varies from 50-65° and modelling implies that the granite underlies the area south of Hogans Road at a depth of 3kms. This supports the field reconnaissance indicating a low grade thermal aureole in this area.

8.6 Consultants Report

Geological Consultant, Petrogenesis Pty. Ltd., was engaged to examine the potential for thermal aureole granite -related gold mineralization in the NE of Tasmania. As part of this evaluation, a brief visit was paid to Golden Ridge where granite contacts, thermally metamorphosed sediments and mineralization styles were examined.

Three extracts from this report are included here as they impact directly on the exploration potential of the area.

viz

1. "A detailed analysis of the structural setting and vein geometry would be required to fully evaluate the prospects in this licence. In general, the historical mines appear to typify the narrow, laterally discontinuous, discrete lode style of mineralization described above. This is confirmed by recent rock-chip sampling. The potential for developing broader zones of auriferous limonitic micro-veining (eg New Golden Ridge) can only be established with a clearer understanding of the structural, lithological and/or chemical controls on mineralization. The available exploration data provides little encouragement for further work".

2. "Devonian batholiths in north-eastern Tasmania were emplaced at high levels into relatively cold crust, and consequently only generated narrow thermal aureoles. In addition, a large proportion of the prospective roof zone of these aureoles has already been eroded or obscured by post-Devonian cover. These factors rank north-eastern Tasmania as a low priority thermal aureole terrain. Conclusions concerning regional prospectivity do not preclude the occurrence of an economically viable gold target, but strongly suggest that such mineralization is likely to be very uncommon."

3. "A thorough appraisal of the ability of discrete lodes to develop marginal stockworks, sheeted veins or stratabound micro-veining, requires detailed structural, lithological and vein geometry data from specific prospects. Very little of this information is currently available. The best target for an economically viable gold resource appears to be zones of sulphide-rich micro-veining. Controls on the distribution of this fracturing are critical. I.P. may be a useful tool for locating this style of mineralization."

Further comment should perhaps be reserved for section .....

9. CONCLUSIONS

Exploration to date within EL 58/88, and more recently ML 43M/88, has identified the Brilliant Creek Goldfield as the main area of interest.

From a regional overview it is probable that only a narrow thermal aureole has been developed around the intrusive Pyengana and Poimena plutons and that most of the prospective aureole has been eroded from the land surface.

The extent of thermal aureole and apparent ductility of the Mathinna Beds in response to granite intrusion suggest a slow cool emplacement along a probable EW fracture. Subsequent fracturing and hydrothermal fluid flow into the inner aureole

appears to be limited in extent and not long lived. The absence of a major structure and repeated fluid flow would tend to downgrade the potential for a large body of mineralization.

If the Golden Ridge pluton can be proved to be a geochemical -ly distinct phase of intrusion then a genetic link between granitoid and mineralization may be likely. In this scenario, the extended exploration at Golden Ridge and further afield looking for Golden Ridge "look-a-likes" may be warranted.

Surface exploration has been successful in outlining several geochemically anomalous areas from the effective use of BLEG soil sampling. The subsurface expression of these anomalies is not known although at Brilliant there is a very good correlation between the soil anomaly and the extent of workings. However, it is surmised that the mineralization may be stratabound within more arenaceous lithologies and as the stratigraphy appears to be gently folded about N-S axis within the aureole, it is quite conceivable that the prospective horizons occur beneath the land surface along Golden Ridge.

The mineralization styles evident at the workings consist of both limonitic micro-veinlet style and quartz lode style but it is considered that the former has much greater potential to form a large tonnage near surface deposit. This sulphide association would possibly support the use of both ground magnetics and electrical geophysics as follow up exploration methods.

10. RECOMMENDATIONS

The magnitude of soil geochemical anomalies, mineralization style evident at Brilliant, local structural pattern and evidence of past workings all support continued exploration at Golden Ridge. The following exploration methods are recommended:

- Ground Magnetics: to cover the gridded area as both a mapping tool and possible detector of pyrrhotite-rich lithologies.

- Dipole-dipole IP: to search for sulphide associated mineralization beneath Golden Ridge.

- Geological Mapping and Rock Chip Sampling: along the eastern grid to identify the probable source of the geochemical anomalies.

- Costeaning: at those areas of geochemical anomalism that can be accessed safely.

- R.C. Percussion Drilling: to test the susurface source of the soil anomalies at Brilliant, New Carthage and Trafalgar.

394032

APPENDIX 1

Geochemical Results
Stream Sediment Samples, Soil Samples, Rock Chip Samples,
Costean Samples

394033

CLASSIC LABORATORIES LTD
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11724/LJ30/JPR Our Job Number : 0AD1362

Samples received : 11-MAY-1990 Results reported : 04-JUN-1990
No. of samples : 236
Report comprises a cover sheet and pages 1 to 6

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

No results available for samples 18016, 18053 and 18055 as brackets split during rolling and all solution was lost.

Note:
If you have any enquiries please contact Mr David Eardley-Harris quoting the above job number.

Approved Signatory:

John Waters
Technical Manager - Adelaide

18201-80 Soils on Ridge Top
18001-157 Soils Regional

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
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EM - Electronic Media
MM - Magnetic Media

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CLASSIC LABORATORIES LTD

394034

Job: 0AD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
18201	10
18202	10
18203	18
18204	0.70
18205	0.35
18206	0.50
18207	0.50
18208	0.40
18209	0.80
18210	0.65
18211	0.50
18212	0.25
18213	0.45
18214	0.35
18215	0.60
18216	0.25
18217	0.15
18218	0.20
18219	0.35
18220	0.10
18221	<0.05
18222	0.05
18223	0.15
18224	0.25
18225	0.10
18226	0.20
18227	0.10
18228	0.50
18229	0.70
18230	0.25
18231	1.75
18232	11
18233	22
18234	11
18235	13
18236	105
18237	4.1
18238	1.05
18239	34
18240	14
18241	22
18242	2.5
18243	10.0
18244	0.30
18245	0.30
Units	ppb
Detn L	0.05
Scheme	BLEG2

394035

CLASSIC LABORATORIES LTD

Job: 0AD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
18246	0.75
18247	3.5
18248	1.25
18249	0.95
18250	1.30
18251	0.70
18252	0.25
18253	1.80
18254	0.85
18255	0.90
18256	0.40
18257	1.40
18258	3.2
18259	3.6
18260	0.90
18261	0.80
18262	1.00
18263	1.50
18264	0.70
18265	1.40
18266	3.1
18267	1.40
18268	2.8
18269	3.5
18270	26
18271	15
18272	11
18273	4.0
18274	1.55
18275	34
18276	22
18277	1.70
18278	1.65
18279	12
18280	14
18001	0.15
18002	0.10
18003	0.90
18004	1.65
18005	1.10
18006	0.25
18007	0.25
18008	0.05
18009	1.60
18010	0.10
Units	ppb
Detn L	0.05
Scheme	BLEG2

↓ Stream sediments

— no locality given

Data base no. ↘

1409
1410

394036

CLASSIC LABORATORIES LTD

Job: OAD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

	Sample	Au
Data basens.		
1411	18011	0.05
2	18012	0.10
3	18013	<0.05
4	18014	2.1
5	18015	0.35
6	18016	N.A.
7	18017	<0.05
8	18018	0.10
9	18019	0.10
1420	18020	0.15
1	18021	0.20
2	18022	0.10
3	18023	<0.05
4	18024	0.85
5	18025	1.65
6	18026	0.25
7	18027	6.5
8	18028	1.05
9	18029	1.50
1430	18030	0.65
1	18031	<0.05
2	18032	0.15
3	18033	<0.05
4	18034	<0.05
5	18035	0.30
6	18036	0.05
7	18037	0.05
8	18038	<0.05
9	18039	0.50
1440	18040	0.40
1	18041	<0.05
2	18042	<0.05
3	18044	0.30
5	18045	<0.05
6	18046	<0.05
7	18047	0.20
8	18048	<0.05
9	18049	0.05
1450	18050	0.10
1	18051	0.05
2	18052	0.25
3	18053	N.A.
4	18054	<0.05
5	18055	N.A.
6	18056	0.40
	Units	ppb
	Detn L	0.05
	Scheme	BLEG2

No 18043

CLASSIC LABORATORIES LTD

Job: 0AD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

Data base no.	Sample	Au
1457	18057	0.05
8	18058	0.60
9	18059	0.45
1460	18060	0.05
1	18061	0.55
2	18062	0.15
3	18063	7.5
4	18064	0.90
5	18065	0.10
6	18066	0.65
7	18067	4.2
8	18068	1.10
9	18069	0.35
1470	18070	0.20
1	18071	0.30
2	18072	0.10
3	18073	<0.05
4	18074	0.25
5	18075	0.75
6	18076	0.05
7	18077	0.10
8	18078	<0.05
9	18079	0.20
1480	18080	<0.05
1	18081	0.35
2	18082	0.30
3	18083	0.10
4	18084	0.30
5	18085	0.25
6	18086	0.30
7	18087	0.05
8	18088	<0.05
9	18089	<0.05
1490	18090	2.0
1	18091	1.80
2	18092	0.55
3	18093	<0.05
4	18094	0.10
5	18095	<0.05
6	18096	1.70
7	18097	2.2
8	18098	0.95
9	18099	1.40
1500	18100	0.35
1	18101	0.15
	Units	ppb
	Detn L	0.05
	Scheme	BLEG2

CLASSIC LABORATORIES LTD

Job: 0AD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

Down hole no	Sample	Au
1502	18102	0.75
3	18103	0.45
4	18104	<0.05
5	18105	<0.05
6	18106	<0.05
7	18107	0.05
8	18108	<0.05
9	18109	<0.05
1510	18110	<0.05
1	18111	0.05
2	18112	<0.05
3	18113	0.05
4	18114	0.20
5	18115	<0.05
6	18116	<0.05
7	18117	<0.05
8	18118	<0.05
9	18119	0.10
1520	18120	0.10
1	18121	0.10
2	18122	0.05
3	18123	0.10
4	18124	<0.05
5	18125	<0.05
6	18126	0.05
7	18127	0.20
8	18128	0.30
9	18129	0.25
1530	18130	<0.05
1	18131	<0.05
2	18132	<0.05
3	18133	0.05
4	18134	0.40
5	18135	0.45
6	18136	1.50
7	18137	0.25
8	18138	0.15
9	18139	0.55
1540	18140	0.25
1	18141	0.25
2	18142	0.10
3	18143	0.55
4	18144	0.10
5	18145	0.45
6	18146	0.20
	Units	ppb
	Detn L	0.05
	Scheme	BLEG2

394039

CLASSIC LABORATORIES LTD

Job: OAD1362
O/N: 11724/LJ30/JPR

ANALYTICAL REPORT

Data base no.	Sample	Au
1547	18147	<0.05
8	18148	<0.05
9	18149	<0.05
1550	18150	0.10
1	18151	0.10
2	18152	0.20
3	18153	0.10
4	18154	0.10
5	18155	0.10
6	18156	<0.05
7	18157	<0.05
	Units	ppb
	Detn L	0.05
	Scheme	BLEG2

CLASSIC LABORATORIES LTD
Incorporated in WA; a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

394040

LJ30
JPR

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11732/LJ30/JPR Our Job Number : 0AD2377

Samples received : 25-JUL-1990 Results reported : 27-AUG-1990
No. of samples : 88
Report comprises a cover sheet and pages 1 to 2

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

19201-88 BLEG
HPLT + following
5 soils.

Note:
If you have any enquiries please contact Mr David Eardley-Harris quoting the above job number.

Approved Signatory:

John Waters
Technical Manager - Adelaide

MM Mr J Randell Devonport

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
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394041

Job: OAD2377
O/N: 11732/LJ30/JPR

ANALYTICAL REPORT

Stream sediments.

Data Base no ↓	Sample	Au
1601	19201	9.5
2	19202	40
3	19203	0.85
4	19204	4.9
5	19205	4.2
6	19206	0.50
7	19207	1.05
8	19208	2.8
9	19209	0.15
1610	19210	0.30
1	19211	11
2	19212	1.60
3	19213	1.90
4	19214	9.5
5	19215	1.40
6	19216	0.60
7	19217	0.90
1618	19218	0.35
	19219	0.35 — NO LOCALITY GIVEN
1620	19220	4.9
1	19221	7.5
2	19222	1.95
3	19223	1.30
4	19224	0.35
5	19225	0.95
6	19226	0.10
7	19227	0.45
8	19228	0.10
9	19229	0.70
1630	19230	0.60
1	19231	0.60
2	19232	0.50
3	19233	0.50
4	19234	0.30
5	19235	0.30
6	19236	0.70
7	19237	0.65
8	19238	8.0
9	19239	0.15
1640	19240	<0.05
1	19241	0.15
2	19242	0.10
3	19243	0.55
4	19244	0.15
5	19245	0.05
	Units	ppb
	DL	0.05
	Scheme	BLEG2

CLASSIC LABORATORIES LTD 394042

Job: OAD2377
O/N: 11732/LJ30/JPR

ANALYTICAL REPORT

	Sample	Au
1646	19246	0.25
7	19247	0.05
8	19248	<0.05
9	19249	<0.05
1650	19250	<0.05
1	19251	0.05
2	19252	0.25
3	19253	0.05
4	19254	2.2
5	19255	0.20
6	19256	1.45
7	19257	0.50
8	19258	0.25
9	19259	0.05
1660	19260	0.05
1	19261	0.05
2	19262	<0.05
3	19263	0.20
4	19264	0.05
1665	19265	0.05
	~~19266~~	~~<0.05~~
	~~19267~~	~~<0.05~~
	~~19268~~	~~0.65~~
	~~19269~~	~~0.25~~
1670	19270	1.85
1	19271	0.05
2	19272	0.05
3	19273	0.05
4	19274	0.20
5	19275	3.3
6	19276	2.3
7	19277	22
8	19278	1.15
9	19279	0.30
1680	19280	0.80
1	19281	0.20
2	19282	0.55
3	19283	0.30
4	19284	<0.05
5	19285	0.75
6	19286	1.65
7	19287	6.5
8	19288	3.1
	Units	ppb
	DL	0.05
	Scheme	BLEG2

NO LOCALITY GIVEN

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Incorporated in WA: a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
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394043

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

Fil. LJ30 S. Sols.

FINAL ANALYSIS REPORT

Your Order No: 11737/LJ30/JPR Our Job Number : 0AD4492

Samples received : 14-DEC-1990 Results reported : 31-DEC-1990
No. of samples : 4
Report comprises a cover sheet and pages 1 to 1

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

18553-56 Follow Up Rec'd S. Sols.

Note:
If you have any enquiries please contact Miss Anne Reed quoting the above job number.

Approved Signatory:

John Waters
Technical Manager - Adelaide

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
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CLASSIC LABORATORIES LTD 394044

Job: 0AD4492
O/N: 11737/LJ30/JPR

ANALYTICAL REPORT

	Sample	Au
1689	18553	1.15
1690	18554	1.95
1691	18555	0.75
1692	18556	0.70
	Units	ppb
	DL	0.05
	Scheme	BLEG2

For locality see TCR 92-3341 (Buck Ck Gully)

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 8890

394045

ANALYTICAL REPORT No. 204.0.081.02074

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
11723	L030

DATE RECEIVED	RESULTS REQUIRED
08/05/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
11	24/05/90	1	252

STATE OF SAMPLES	PRE-TREATMENT							ANALYSIS		
REF BELC	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	<18,301/552	RD	Prep: 006,010,011,012,013,016						Au,AuChk/313		
	<18,301/552	RD							As/401		

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

Costein
Samples
18301 - 552 Au
As

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorption	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

ANALYTICAL DATA

394046

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.05.07074	24/05/90	11723	1 OF 1

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18301	0.038	0.040	<2						
2	18302	0.038	—	<2						
3	18303	0.047	—	2						
4	18304	0.204	—	<2						
5	18305	0.578	—	2						
6	18306	1.798	—	<2						
	18307	0.243	—	2						
8	18308	0.050	—	<2						
9	18309	0.192	—	<2						
10	18310	0.391	—	<2						
11	18311	0.542	—	<2						
12	18312	0.596	—	<2						
13	18313	2.000	—	<2						
14	18314	0.999	—	<2						
15	18315	1.223	—	<2						
	18316	0.250	—	<2						
17	18317	0.910	0.939	<2						
18	18318	4.650	—	<2						
19	18319	0.696	—	<2						
20	18320	0.541	—	<2						
21	18321	0.307	—	<2						
22	18322	0.101	—	<2						
23	18323	0.039	—	9						
24	18324	0.011	0.010	<2						
25	18325	0.027	—	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER Jenkins

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394047

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	2 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18326	0.130	—	2						
2	18327	0.038	—	3						
3	18328	0.030	—	<2						
4	18329	0.049	—	4						
5	18330	0.330	—	5						
6	18331	0.925	—	<2						
7	18332	0.210	—	<2						
8	18333	0.396	—	3						
9	18334	0.457	0.465	3						
10	18335	0.372	—	<2						
11	18336	1.385	—	<2						
12	18337	0.771	—	<2						
13	18338	0.219	—	<2						
14	18339	0.665	—	3						
15	18340	0.409	—	2						
	18341	0.400	—	<2						
17	18342	0.338	—	<2						
18	18343	0.196	—	<2						
19	18344	0.133	—	2						
20	18345	0.132	0.119	<2						
21	18346	0.051	—	10						
22	18347	0.040	—	4						
23	18348	0.030	—	<2						
24	18349	0.033	—	<2						
25	18350	0.043	0.043	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394048

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	3 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18351	0.020	—	<2						
2	18352	0.015	—	<2						
3	18353	0.118	—	10						
4	18354	0.150	0.140	<2						
5	18355	0.100	—	<2						
6	18356	0.250	—	<2						
7	18357	6.130	—	<2						
8	18358	0.236	—	<2						
9	18359	0.563	—	<2						
10	18360	2.500	—	4						
11	18361	2.900	—	2						
12	18362	1.356	—	3						
13	18363	0.200	—	2						
14	18364	0.197	—	<2						
15	18365	0.905	—	8						
16	18366	3.160	2.970	6						
17	18367	1.794	—	4						
18	18368	0.465	—	6						
19	18369	0.686	—	<2						
20	18370	0.726	—	<2						
21	18371	0.873	—	<2						
22	18372	0.630	—	5						
23	18373	0.810	—	2						
24	18374	0.397	0.372	<2						
25	18375	0.790	—	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394049

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	4 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18376	0.087	—	2						
2	18377	0.083	—	<2						
3	18378	0.042	—	<2						
4	18379	1.870	—	<2						
5	18380	0.522	—	<2						
6	18381	0.135	—	<2						
7	18382	0.048	—	<2						
8	18383	0.061	—	<2						
9	18384	0.117	—	<2						
10	18385	0.122	—	<2						
11	18386	0.101	0.150	<2						
12	18387	0.043	—	4						
13	18388	0.018	—	<2						
14	18389	0.038	—	6						
15	18390	0.104	—	<2						
	18391	0.050	—	4						
17	18392	0.034	—	<2						
18	18393	0.073	—	5						
19	18394	0.045	—	10						
20	18395	0.009	—	<2						
21	18396	0.106	—	10						
22	18397	0.199	—	35						
23	18398	0.059	—	<2						
24	18399	0.047	—	<2						
25	18400	<0.005	0.010	10						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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394050

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	5 OF

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18401	0.037	–	2						
2	18402	0.059	0.050	3						
3	18403	0.107	–	<2						
4	18404	0.084	–	<2						
5	18405	0.059	–	9						
6	18406	0.032	–	6						
7	18407	0.103	–	9						
8	18408	0.028	–	10						
9	18409	0.073	–	3						
10	18410	0.042	–	<2						
11	18411	0.093	–	<2						
12	18412	0.025	–	<2						
13	18413	0.025	–	<2						
14	18414	<0.005	–	<2						
15	18415	<0.005	–	<2						
	18416	<0.005	–	<2						
17	18417	<0.005	–	<2						
18	18418	<0.005	<0.005	<2						
19	18419	<0.005	<0.005	<2						
20	18420	<0.005	–	<2						
21	18421	<0.005	–	<2						
22	18422	<0.005	–	<2						
23	18423	<0.005	–	<2						
24	18424	<0.005	<0.005	<2						
25	18425	<0.005	–	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

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394051

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.03.07074	24/05/90	11723	6 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18426	<0.005	—	<2						
2	18427	<0.005	—	<2						
3	18428	<0.005	—	<2						
4	18429	<0.005	—	3						
5	18430	<0.005	—	3						
6	18431	<0.005	—	<2						
7	18432	<0.005	<0.005	<2						
8	18433	<0.005	<0.005	<2						
9	18434	0.005	—	<2						
10	18435	<0.005	—	<2						
11	18436	<0.005	—	3						
12	18437	<0.005	—	<2						
13	18438	<0.005	—	3						
14	18439	<0.005	—	2						
15	18440	<0.005	—	<2						
16	18441	<0.005	—	3						
17	18442	<0.005	—	9						
18	18443	<0.005	—	8						
19	18444	<0.005	<0.005	8						
20	18445	<0.005	—	3						
21	18446	<0.005	—	10						
22	18447	<0.005	—	6						
23	18448	<0.005	—	3						
24	18449	<0.005	—	3						
25	18450	<0.005	—	<2						

Results in ppm unless otherwise specified
T = element present, but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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394052

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	7 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18451	<0.005	<0.005	<2						
2	18452	<0.005	–	2						
3	18453	<0.005	–	2						
4	18454	<0.005	–	<2						
5	18455	<0.005	–	<2						
6	18456	0.700	–	40						
7	18457	0.016	–	20						
8	18458	0.009	–	8						
9	18459	0.367	–	15						
10	18460	0.019	–	15						
11	18461	0.018	–	7						
12	18462	<0.005	–	4						
13	18463	<0.005	–	2						
14	18464	<0.005	<0.005	2						
15	18465	<0.005	<0.005	2						
16	18466	0.011	–	20						
17	18467	0.016	–	30						
18	18468	0.105	–	15						
19	18469	<0.005	–	5						
20	18470	<0.005	–	<2						
21	18471	0.025	–	25						
22	18472	0.033	–	20						
23	18473	0.028	–	15						
24	18474	0.009	–	2						
25	18475	0.010	–	40						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	8 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18476	<0.005	—	6						
2	18477	<0.005	—	<2						
3	18478	<0.005	—	<2						
4	18479	0.005	—	<2						
5	18480	0.006	—	<2						
6	18481	<0.005	<0.005	<2						
7	18482	0.008	—	<2						
8	18483	<0.005	—	<2						
9	18484	<0.005	—	<2						
10	18485	<0.005	—	<2						
11	18486	<0.005	—	4						
12	18487	0.043	—	60						
13	18488	<0.005	—	15						
14	18489	<0.005	—	25						
15	18490	0.009	—	200						
16	18491	<0.005	—	30						
17	18492	<0.005	—	50						
18	18493	<0.005	<0.005	6						
19	18494	<0.005	—	6						
20	18495	0.040	0.032	130						
21	18496	0.025	—	8						
22	18497	0.065	0.054	55						
23	18498	0.069	—	85						
24	18499	0.015	—	30						
25	18500	0.013	—	30						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	9 OF 1

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18501	0.020	–	85						
2	18502	0.036	–	75						
3	18503	0.015	–	75						
4	18504	0.073	–	80						
5	18505	0.139	–	90						
6	18506	<0.005	–	65						
7	18507	0.023	–	75						
8	18508	0.022	–	9						
9	18509	<0.005	–	100						
10	18510	<0.005	–	40						
11	18511	<0.005	–	<2						
12	18512	<0.005	<0.005	<2						
13	18513	<0.005	–	<2						
14	18514	<0.005	–	<2						
15	18515	<0.005	–	<2						
16	18516	<0.005	–	<2						
17	18517	<0.005	<0.005	<2						
18	18518	0.803	–	25						
19	18519	0.005	–	75						
20	18520	0.007	–	280						
21	18521	0.027	–	2						
22	18522	0.026	0.023	2						
23	18523	0.027	–	<2						
24	18524	0.040	–	2						
25	18525	0.022	–	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

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394055

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	10 OF 11

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18526	0.041	—	3						
2	18527	0.053	—	7						
3	18528	0.222	0.210	8						
4	18529	0.305	—	2						
5	18530	1.160	—	10						
6	18531	1.330	—	7						
7	18532	0.865	—	10						
8	18533	0.109	—	3						
9	18534	0.060	—	4						
10	18535	0.170	—	<2						
11	18536	0.108	—	<2						
12	18537	0.025	—	2						
13	18538	0.035	—	6						
14	18539	0.406	—	6						
15	18540	0.050	—	2						
16	18541	0.024	—	9						
17	18542	0.103	—	<2						
18	18543	0.016	—	<2						
19	18544	0.046	0.021	<2						
20	18545	0.042	—	<2						
21	18546	0.164	—	2						
22	18547	0.101	—	<2						
23	18548	0.033	—	<2						
24	18549	0.034	—	<2						
25	18550	0.037	—	<2						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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394056

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07074	24/05/90	11723	1 OF 1

TUBE No.	SAMPLE No.	Au	AuChk	As						
1	18551	0.027	–	<2						
2	18552	0.008	–	<2						
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.005	0.005	2						
24	UNITS	ppm	ppm	ppm						
25	METHOD	313	313	401						

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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394057

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999
52 Murray Road, Welshpool, W.A. 6106
Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 204.0.00.07104

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
11725	LJ30

DATE RECEIVED	RESULTS REQUIRED
22/05/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
4	29/05/90	1	83

STATE OF SAMPLES	PRE-TREATMENT							ANALYSIS		
REF BELL	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PUL-VERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	Various	RD	Prep: 010	012,013,016					Au,AuChk/313		
	Various	RD	Prep: 006	010,011,012,013,016					Au,AuChk/313		

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

Core Room Sample
Re-Split

18304-06
18311-20
18323-26
18330-31
18336-39
18348-50
18356-76
18379-86
18392-95
18407-10
18487-94
18501-06
18528-33

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394058

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07104	29/05/90	11725	1 OF 4

TUBE No.	SAMPLE No.	Au	AuChk.
1	18304	0.353	0.154
2	18305	0.554	—
3	18306	1.310	—
4	18311	0.552	—
5	18312	0.820	—
6	18313	2.080	—
7	18314	1.120	—
8	18315	1.220	—
9	18316	0.204	—
10	18317	0.807	—
11	18318	5.180	—
12	18319	0.704	—
13	18320	0.490	0.492
14	18323	0.045	—
15	18324	0.019	—
	18325	0.028	0.029
17	18326	0.141	—
18	18330	0.362	—
19	18331	0.989	—
20	18336	1.210	—
21	18337	0.798	—
22	18338	0.239	—
23	18339	0.707	—
24	18348	0.048	—
25	18349	0.044	—

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394059

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07104	29/05/90	11725	3 OF 4

TUBE No.	SAMPLE No.	Au	AuChk
1	18382	0.050	—
2	18383	0.069	—
3	18384	0.031	—
4	18385	0.133	—
5	18386	0.111	—
6	18392	0.041	—
7	18393	0.086	—
8	18394	0.041	—
9	18395	0.019	—
10	18407	0.074	—
11	18408	0.028	—
12	18409	0.066	—
13	18410	0.049	—
14	18487	0.038	0.034
15	18488	<0.005	—
	18489	0.015	—
17	18490	0.021	—
18	18491	0.009	—
19	18492	0.008	—
20	18493	0.006	—
21	18494	0.012	<0.005
22	18501	0.031	—
23	18502	0.050	—
24	18503	0.030	—
25	18504	0.051	—

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394060

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.88.07104	29/05/90	11725	4 OF 4

TUBE No.	SAMPLE No.	Au	AuChk							
1	18505	0.188	—							
2	18506	0.011	—							
3	18528	0.222	—							
4	18529	0.264	—							
5	18530	0.957	0.954							
6	18531	1.280	1.420							
7	18532	0.610	—							
8	18533	0.470	—							
9										
10										
11										
12										
13										
14										
15										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.005	0.005							
24	UNITS	ppm	ppm							
25	METHOD	313	313							

Results in ppm unless otherwise specified
T = element present: but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

CLASSIC LABORATORIES LTD
Incorporated in WA: a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

394061

Mr Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11730/LJ30/JPR Our Job Number : 0AD1991

Samples received : 27-JUN-1990 Results reported : 02-JUL-1990
No. of samples : 101
Report comprises a cover sheet and pages 1 to 3

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

Note:
If you have any enquiries please contact Mr David Eardley-Harris quoting the above job number.

16959-76 Costean r.chips.

19101-83 Costean re-samples (duplicates)

Approved Signatory:

John Waters
Technical Manager - Adelaide

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

"RELIABLE ANALYSES AT COMPETITIVE COST"

CLASSIC LABORATORIES LTD

394062

Job: 0AD1991
O/N: 11730/LJ30/JPR

ANALYTICAL REPORT

Sample	Au Avg	Au	Au Rp1	Au SS1
16959	0.49	0.38	0.60	--
16960	0.11	0.07	0.15	--
16961	1.55	2.90	0.41	1.34
16962	0.44	0.43	0.45	--
16963	0.88	0.88	--	--
16964	0.70	0.70	--	--
16965	11.2	10.9	11.5	--
16966	0.07	0.07	--	--
16967	0.04	0.04	--	--
16968	0.43	0.43	--	--
16969	0.35	0.35	--	--
16970	3.36	3.48	3.24	--
16971	0.04	0.04	--	--
16972	0.49	0.49	--	--
16973	1.40	1.28	1.54	--
16974	1.32	1.18	1.46	--
16975	0.54	0.54	--	--
16976	0.01	0.01	--	--
19101	1.62	1.56	1.66	--
19102	3.75	2.15	3.80	5.32
19103	0.68	0.58	0.80	--
19104	0.36	0.36	--	--
19105	1.04	0.96	1.14	--
19106	0.27	0.27	--	--
19107	1.02	1.18	0.86	--
19108	0.50	0.50	--	--
19109	0.40	0.40	--	--
19110	0.35	0.35	--	--
19111	0.76	0.80	0.72	--
19112	0.07	0.07	--	--
19113	0.07	0.07	--	--
19114	0.02	0.02	--	--
19115	0.03	0.03	--	--
19116	0.04	0.04	--	--
19117	0.09	0.09	--	--
19118	0.29	0.29	--	--
19119	0.76	0.76	--	--
19120	1.22	1.16	1.26	--
19121	0.84	0.88	0.82	--
19122	0.30	0.30	--	--
19123	0.41	0.41	--	--
19124	0.03	0.03	--	--
19125	0.04	0.04	--	--
19126	0.09	0.09	--	--
19127	0.22	0.22	--	--
Units	ppm	ppm	ppm	ppm
DL	0.01	0.01	0.01	0.01
Scheme	FA1	FA1	FA1	FA1

Job: 0AD1991
O/N: 11730/LJ30/JPR

ANALYTICAL REPORT

Sample	Au Avg	Au	Au Rp1	Au SS1
19128	1.48	1.30	1.68	--
19129	0.48	0.48	--	--
19130	0.26	0.26	--	--
19131	1.90	1.88	1.92	--
19132	3.2	4.6	1.98	3.0
19133	0.88	0.86	0.88	--
19134	0.13	0.13	--	--
19135	0.50	0.50	--	--
19136	0.52	0.48	0.56	--
19137	2.7	2.5	2.9	--
19138	0.98	1.10	0.86	--
19139	0.66	0.66	--	--
19140	0.78	0.78	--	--
19141	1.00	0.92	1.08	--
19142	1.38	1.12	1.62	1.40
19143	0.52	0.52	--	--
19144	0.42	0.42	--	--
19145	0.36	0.36	--	--
19146	1.18	1.00	1.38	--
19147	0.07	0.07	--	--
19148	0.32	0.32	--	--
19149	0.34	0.34	--	--
19150	0.09	0.09	--	--
19151	0.04	0.04	--	--
19152	0.05	0.05	--	--
19153	0.10	0.10	--	--
19154	0.05	0.05	--	--
19155	0.05	0.05	--	--
19156	0.05	0.05	--	--
19157	0.03	0.03	--	--
19158	0.04	0.04	--	--
19159	0.05	0.05	--	--
19160	<0.01	<0.01	--	--
19161	0.11	0.11	--	--
19162	0.02	0.02	--	--
19163	0.04	0.04	--	--
19164	0.15	0.15	--	--
19165	0.15	0.15	--	--
19166	0.22	0.22	--	--
19167	0.78	0.78	--	--
19168	0.58	0.58	--	--
19169	0.62	0.62	--	--
19170	0.11	0.12	0.09	--
19171	0.03	0.03	--	--
19172	<0.01	<0.01	--	--
Units	ppm	ppm	ppm	ppm
DL	0.01	0.01	0.01	0.01
Scheme	FA1	FA1	FA1	FA1

CLASSIC LABORATORIES LTD

394064

Job: 0AD1991
O/N: 11730/LJ30/JPR

ANALYTICAL REPORT

Sample	Au Avg	Au	Au Rp1	Au SS1
19173	0.05	0.05	--	--
19174	0.02	0.02	--	--
19175	<0.01	<0.01	--	--
19176	<0.01	<0.01	--	--
19177	<0.01	<0.01	--	--
19178	0.02	0.02	--	--
19179	0.09	0.09	--	--
19180	0.06	0.06	--	--
19181	0.03	0.03	--	--
19182	0.01	0.01	--	--
19183	<0.01	<0.01	--	--
Units	ppm	ppm	ppm	ppm
DL	0.01	0.01	0.01	0.01
Scheme	FA1	FA1	FA1	FA1

ANALABS

394065

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 52 Murray Road, Welshpool, W.A. 6106 Telex AA92560
FAX: 004 31 8890

ANALYTICAL REPORT No. 204.0.08.07174

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
11729	LJ30

DATE RECEIVED	RESULTS REQUIRED
18/06/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	26/06/90	1	50

STATE OF SAMPLES		PRE-TREATMENT							ANALYSIS		
REF BELL	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PUL-VERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	(1,6977/7000,9301/9326	RO	Prep: 006,010,011,012,013,016						Au,AuChk/313		

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

Rock Chips
Grid Map.
16977 - 17000
19301 - 26

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394066

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07174	26/06/90	11729	1 OF

TUBE No.	SAMPLE No.	Au	AuChk
1	16977	<0.005	<0.005
2	16978	0.005	—
3	16979	<0.005	—
4	16980	<0.005	—
5	16981	<0.005	—
6	16982	0.005	—
7	16983	<0.005	—
8	16984	<0.005	—
9	16985	0.005	—
10	16986	<0.005	—
11	16987	<0.005	—
12	16988	0.078	—
13	16989	0.066	0.068
14	16990	0.072	—
15	16991	0.478	—
	16992	0.203	0.264
17	16993	0.022	—
18	16994	0.013	—
19	16995	0.029	—
20	16996	0.038	—
21	16997	0.197	—
22	16998	<0.005	—
23	16999	<0.005	—
24	17000	<0.005	—
25	19301	<0.005	—

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

394067

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07174	26/06/90	11729	2 OF 3

TUBE No.	SAMPLE No.	Au	AuChk							
1	19302	0.299	0.355							
2	19303	0.015	—							
3	19304	0.005	—							
4	19305	0.020	—							
5	19306	0.008	—							
6	19307	<0.005	—							
7	19308	<0.005	<0.005							
8	19309	0.030	—							
9	19310	<0.005	—							
10	19311	0.013	—							
11	19312	0.010	—							
12	19313	<0.005	—							
13	19314	<0.005	—							
14	19315	0.133	—							
15	19316	<0.005	—							
	19317	<0.005	—							
17	19318	0.031	0.041							
18	19319	0.019	—							
19	19320	0.018	—							
20	19321	0.005	—							
21	19322	0.376	—							
22	19323	0.012	—							
23	19324	<0.005	<0.005							
24	19325	<0.005	—							
25	19326	<0.005	—							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

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A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394068

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07174	26/06/90	11729	3 OF 3

TUBE No.	SAMPLE No.	Au	AuChk							
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
17										
18										
19										
20										
21										
22	DETECTION	0.005	0.005							
23	UNITS	ppm	ppm							
24	METHOD	313	313							
25										

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560
FAX: 004 31 8890

394069

ANALYTICAL REPORT No. 204.0.08.07139

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

ORDER No.	PROJECT
N[illegible] 11727	LJ 30

DATE RECEIVED	RESULTS REQUIRED
01/06/90	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
5	19/06/90	1	105

STATE OF SAMPLES	PRE-TREATMENT								ANALYSIS			
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	<169,59/76,<191,01/87	RC	Prep: 006,010,011,012,013,016						Au,AuChk/309		

RESULTS TO

The Shell Company of Australia
Metals Division
P.O. Box 860
Devonport Tasmania 7310

RESULTS TO

REMARKS

Golden Ridge
R.C chips
Reports

16959-76 Costean r. chips
19101-87 Costean r-samples
(duplicates)

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
t ssue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394070

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07139	19/06/90	N1727	1 OF 5

TUBE No.	SAMPLE No.	Au	AuChk							
1	16959	0.436	0.574							
2	16960	0.045	—							
3	16961	1.465	—							
4	16962	0.451	—							
5	16963	1.031	—							
6	16964	0.539	—							
	16965	6.770	—							
8	16966	0.017	—							
9	16967	0.015	—							
10	16968	0.477	—							
11	16969	0.393	—							
12	16970	3.640	—							
13	16971	0.026	—							
14	16972	0.382	—							
15	16973	1.450	—							
	16974	1.254	1.467							
17	16975	0.639	—							
18	16976	<0.008	—							
19	19101 18301	1.740	2.010							
20	19102 18305	2.770	—							
21	19103 18306	1.021	—							
22	19104 18311	0.251	—							
23	19105 18312	1.305	—							
24	19106 18313	0.308	—							
25	19107 18314	0.848	—							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER Jenkins

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394071

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07139	19/06/90	N1727	2 OF 5

TUBE No.	SAMPLE No.	Au	AuChk							
1	19108 18315	0.540	—							
2	19109 18316	0.583	—							
3	19110 18317	0.478	—							
4	19111 18318	2.010	—							
5	19112 18319	0.087	—							
6	19113 18320	0.066	—							
7	19114 18321	0.035	0.042							
8	19115 18324	<0.008	—							
9	19116 18325	0.030	—							
10	19117 18326	0.119	—							
11	19118 18330	0.315	—							
12	19119 18331	0.650	—							
13	19120 18336	1.269	—							
14	19121 18337	1.069	1.113							
15	19122 18338	0.217	—							
16	19123 18339	0.563	—							
17	19124 18342	0.037	0.041							
18	19125 18349	0.039	—							
19	19126 18350	0.097	—							
20	19127 18356	0.263	—							
21	19128 18357	1.452	—							
22	19129 18358	0.538	—							
23	19130 18359	0.269	0.250							
24	19131 18360	2.390	—							
25	19132 18361	2.810	—							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394072

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07139	19/06/90	H1727	3 OF

TUBE No.	SAMPLE No.	Au	AuChk							
1	19133 18362	1.115	—							
2	19134 18363	0.176	—							
3	19135 18364	0.544	—							
4	19136 18365	0.624	—							
5	19137 18366	3.400	—							
6	19138 18367	1.314	—							
	19139 18368	1.216	—							
8	19140 18369	0.623	—							
9	19141 18370	1.081	—							
10	19142 18371	0.920	—							
11	19143 18372	1.149	—							
12	19144 18373	0.703	—							
13	19145 18374	0.505	—							
14	19146 18375	1.587	—							
15	19147 18376	0.112	—							
16	19148 18377	0.414	—							
17	19149 18380	0.410	—							
18	19150 18381	0.123	0.120							
19	19151 18382	0.067	—							
20	19152 18383	1.142	—							
21	19153 18384	0.154	—							
22	19154 18385	0.109	—							
23	19155 18386	0.060	—							
24	19156 18392	0.096	—							
25	19157 18393	0.045	—							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty Ltd.

394073

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07139	19/06/90	M1727	4 OF 5

TUBE No.	SAMPLE No.	Au	AuChk
1	19158 18394	0.093	—
2	19159 18395	0.078	—
3 (5)	19160 18407	0.047	—
4	19161 18408	0.143	0.126
5	19162 18409	0.042	—
6	19163 18410	0.071	—
(10)	19164 18528	0.055	—
8	19165 18529	0.203	—
9	19166 18530	0.272	0.293
10	19167 18531	1.000	—
11	19168 18532	0.607	—
12	19169 18533	1.225	—
13 (8)	19170 18497	0.035	—
14	19171 18498	0.051	—
15	19172 18489	0.020	—
[illegible]	19173 18490	0.053	—
17	19174 18491	0.050	—
18	19175 18492	0.028	0.030
19	19176 18493	0.018	—
20	19177 18494	0.027	—
21 (9)	19178 18501	0.065	—
22	19179 18502	0.099	—
23	19180 18503	0.111	—
24	19181 18504	0.066	—
25	19182 18505	0.026	0.024

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

ANALABS

A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

394074

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	204.0.08.07139	19/06/90	N1727	5 OF 5

TUBE No.	SAMPLE No.	Au	AuChk							
1	19183 18506	0.020	—							
2	19184 STD 0.2	0.190	—							
3	19185 STD 0.75	0.857	—							
4	19186 STD 0.2	0.337	—							
5	19187 STD 0.75	0.707	—							
6										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.008	0.008							
24	UNITS	ppm	ppm							
25	METHOD	309	309							

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
— = element not determined

AUTHORISED OFFICER

CLASSIC LABORATORIES LTD
Incorporated in WA; a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

394075

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11728/LJ30/JPR Our Job Number : 0AD1916

Samples received : 20-JUN-1990 Results reported : 09-JUL-1990
No. of samples : 147
Report comprises a cover sheet and pages 1 to 4

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

Please note there are no results available for samples 19060, 19063 and 19065 as the buckets split and no solution is available for assay. We apologise for the inconvenience caused.

Note:
If you have any enquiries please contact Mr David Eardley-Harris quoting the above job number.

18901-65 BLEK Soils Gra
19001-82 " " "

Approved Signatory:

John Waters
Technical Manager - Adelaide

MM Mr Jeff Randell Devonport

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

"RELIABLE ANALYSES AT COMPETITIVE COST"

CLASSIC LABORATORIES LTD

394076

Job: OAD1916
O/N: 11728/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
18901	2.9
18902	11
18903	7.0
18904	2.8
18905	10
18906	3.2
18907	1.80
18908	1.20
18909	0.25
18910	1.55
18911	0.20
18912	0.30
18913	0.05
18914	<0.05
18915	0.05
18916	<0.05
18917	0.05
18918	1.90
18919	0.20
18920	0.10
18921	0.85
18922	0.15
18923	0.20
18924	0.10
18925	0.50
18926	0.85
18927	0.30
18928	1.70
18929	1.80
18930	2.6
18931	10.0
18932	3.0
18933	1.20
18934	0.60
18935	1.95
18936	0.60
18937	2.0
18938	3.2
18939	2.1
18940	3.9
18941	0.60
18942	0.90
18943	2.5
18944	2.2
18945	3.6
Units	ppb
DL	0.05
Scheme	BLEG2

Job: 0AD1916
O/N: 11728/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
18946	6.0
18947	50
18948	6.5
18949	40
18950	2.6
18951	1.50
18952	13
18953	3.8
18954	3.8
18955	3.7
18956	3.0
18957	2.3
18958	3.7
18959	2.9
18960	3.3
18961	1.90
18962	2.4
18963	10
18964	1.45
18965	3.1
19001	2.0
19002	12
19003	2.6
19004	14
19005	80
19006	300
19007	130
19008	19
19009	1.75
19010	3.6
19011	1.10
19012	0.40
19013	0.35
19014	0.30
19015	0.25
19016	0.05
19017	0.10
19018	0.15
19019	0.10
19020	0.15
19021	<0.05
19022	0.15
19023	1.40
19024	0.35
19025	0.95
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394078

Job: 0AD1916
O/N: 11728/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19026	6.5
19027	14
19028	0.25
19029	0.90
19030	2.4
19031	1.50
19032	0.70
19033	0.45
19034	0.40
19035	0.40
19036	1.20
19037	0.45
19038	0.95
19039	1.10
19040	1.00
19041	0.80
19042	1.85
19043	0.20
19044	0.40
19045	10
19046	20
19047	0.35
19048	2.2
19049	0.25
19050	17
19051	0.30
19052	0.30
19053	0.35
19054	10.0
19055	0.20
19056	1.05
19057	0.75
19058	0.25
19059	0.35
19060	N.A.
19061	0.10
19062	0.15
19063	N.A.
19064	0.05
19065	N.A.
19066	<0.05
19067	<0.05
19068	<0.05
19069	0.10
19070	<0.05
Units	ppb
DL	0.05
Scheme	BLEG2

Job: 0AD1916
O/N: 11728/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19071	<0.05
19072	2.8
19073	0.45
19074	<0.05
19075	0.30
19076	0.20
19077	<0.05
19078	0.25
19079	0.25
19080	0.15
19081	<0.05
19082	0.20
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD
Incorporated in WA; a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

394080

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11735/LD61/LJ30/JPR Our Job Number : 0AD3258

Samples received : 03-OCT-1990 Results reported : 15-NOV-1990
No. of samples : 371
Report comprises a cover sheet and pages 1 to 9

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

Note:
If you have any enquiries please contact Miss Anne Reed quoting the above job number.

Approved Signatory:

John Waters
Technical Manager - Adelaide

19701-13
15-27
29-41
43-55
57-19800
19808-850
19868-20105

Grid
Soil

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

"RELIABLE ANALYSES AT COMPETITIVE COST"

CLASSIC LABORATORIES LTD

394081

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19701	0.40
19702	1.10
19703	2.9
19704	0.40
19705	0.50
19706	0.20
19707	<0.05
19708	0.20
19709	0.25
19710	<0.05
19711	0.35
19712	0.15
19713	0.15
19715	0.30
19716	0.85
19717	<0.05
19718	0.25
19719	0.40
19720	0.25
19721	0.10
19722	<0.05
19723	<0.05
19724	0.25
19725	0.10
19726	0.10
19727	0.35
19729	2.1
19730	0.40
19731	0.80
19732	38
19733	0.15
19734	0.30
19735	0.25
19736	0.25
19737	0.15
19738	0.10
19739	0.15
19740	0.15
19741	0.15
19743	15
19744	7.5
19745	2.2
19746	2.8
19747	0.65
19748	0.75
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394082

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19749	0.30
19750	0.20
19751	0.40
19752	0.40
19753	0.05
19754	0.10
19755	<0.05
19757	1.00
19758	0.60
19759	1.05
19760	0.85
19761	0.20
19762	<0.05
19763	0.15
19764	0.75
19765	0.55
19766	0.25
19767	0.65
19768	<0.05
19769	<0.05
19770	<0.05
19771	<0.05
19772	<0.05
19773	3.6
19774	8.0
19775	4.6
19776	0.40
19777	2.5
19778	0.35
19779	0.40
19780	3.8
19781	1.20
19782	4.6
19783	3.4
19784	4.8
19785	4.5
19786	0.60
19787	0.10
19788	0.10
19789	1.10
19790	0.90
19791	1.30
19792	0.80
19793	0.35
19794	1.80
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394083

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19795	3.3
19796	0.95
19797	2.6
19798	2.3
19799	1.15
19800	1.90
19808	0.40
19809	2.3
19810	2.1
19811	0.70
19812	3.9
19813	2.4
19814	2.0
19815	1.90
19816	2.0
19817	0.85
19818	1.35
19819	0.55
19820	0.80
19821	1.85
19822	1.35
19823	1.60
19824	0.45
19825	0.45
19826	0.60
19827	0.40
19828	2.1
19829	0.60
19830	0.65
19831	0.85
19832	1.80
19833	0.60
19834	1.65
19835	2.3
19836	1.10
19837	18
19838	9.5
19839	1.90
19840	4.3
19841	8.5
19842	3.7
19843	3.3
19844	26
19845	9.5
19846	1.70
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394084

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19847	1.20
19848	2.6
19849	0.75
19850	0.40
19868	1.10
19869	8.0
19870	6.5
19871	8.0
19872	5.5
19873	7.5
19874	1.80
19875	0.40
19876	0.80
19877	0.30
19878	1.20
19879	1.45
19880	1.85
19881	1.95
19882	4.1
19883	3.0
19884	4.3
19885	1.85
19886	1.55
19887	0.50
19888	1.30
19889	2.8
19890	2.7
19891	1.35
19892	2.2
19893	2.9
19894	1.55
19895	6.5
19896	8.0
19897	8.5
19898	5.0
19899	7.5
19900	1.40
19901	12
19902	12
19903	15
19904	1.75
19905	6.5
19906	18
19907	6.0
19908	8.5
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394085

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19909	9.5
19910	6.5
19911	3.0
19912	7.0
19913	6.5
19914	3.7
19915	0.90
19916	0.60
19917	0.75
19918	0.10
19919	1.25
19920	0.35
19921	0.05
19922	0.05
19923	0.40
19924	0.10
19925	0.10
19927	3.3
19928	0.25
19929	0.60
19930	8.0
19931	1.45
19932	1.20
19933	0.70
19934	0.55
19935	1.20
19936	0.50
19937	1.90
19938	1.90
19939	100
19940	6.5
19941	3.8
19942	2.2
19943	6.0
19944	3.5
19945	2.4
19946	3.3
19947	2.6
19948	6.5
19949	2.7
19950	4.3
19951	4.0
19952	8.0
19953	4.6
19954	6.5
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394086

Job: OAD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19955	7.0
19956	13
19957	9.0
19958	15
19959	5.5
19960	7.5
19961	3.5
19962	6.0
19963	24
19964	8.5
19965	24
19966	22
19967	2.1
19968	6.5
19969	0.80
19970	0.30
19971	0.95
19972	1.60
19973	1.10
19974	1.25
19975	0.35
19976	0.20
19977	0.15
19978	0.30
19979	0.20
19980	0.20
19981	0.10
19982	0.30
19983	0.25
19984	0.20
19985	0.10
19986	<0.05
19987	<0.05
19988	0.55
19989	0.15
19990	0.75
19991	0.10
19992	<0.05
19993	1.50
19994	0.20
19995	0.35
19996	0.20
19997	3.3
19998	6.5
19999	19
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394087

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20000	5.5
20001	7.5
20002	9.0
20003	2.6
20004	3.4
20005	7.0
20006	0.90
20007	1.00
20008	3.6
20009	0.55
20010	1.65
20011	0.50
20012	0.35
20013	0.80
20014	0.15
20015	0.95
20016	<0.05
20017	1.95
20018	1.20
20019	0.50
20020	0.20
20021	1.20
20022	0.60
20023	<0.05
20024	0.40
20025	1.00
20026	7.5
20027	50
20028	5.5
20029	9.5
20030	1.85
20031	0.70
20032	0.05
20033	0.05
20034	0.05
20035	0.60
20036	0.15
20037	<0.05
20038	<0.05
20039	<0.05
20040	<0.05
20041	<0.05
20042	<0.05
20043	<0.05
20044	0.40
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394088

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20045	<0.05
20046	0.60
20047	1.45
20048	5.0
20049	22
20050	1.60
20051	0.55
20052	4.6
20053	4.0
20054	4.5
20055	2.9
20056	3.7
20057	15
20058	11
20059	4.7
20060	3.7
20061	1.95
20062	3.8
20063	0.75
20064	0.25
20065	0.85
20066	0.55
20067	0.75
20068	0.85
20069	1.35
20070	0.50
20071	0.65
20072	2.6
20073	3.8
20074	3.6
20075	4.3
20076	1.55
20077	4.6
20078	7.5
20079	19
20080	3.8
20081	3.0
20082	5.5
20083	5.5
20084	7.0
20085	4.2
20086	6.5
20087	0.95
20088	0.95
20089	3.9
Units	ppb
DL	0.05
Scheme	BLEG2

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394089

Job: 0AD3258
O/N: 11735/LD61/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20090	2.6
20091	0.85
20092	0.75
20093	0.45
20094	0.60
20095	0.20
20101	1.25
20102	4.2
20103	4.5
20104	2.0
20105	2.2
Units	ppb
DL	0.05
Scheme	BLEG2

394090

CLASSIC LABORATORIES LTD
Incorporated in WA, a wholly owned subsidiary of Amdel Ltd
Osman Place, Thebarton, South Australia 5031
Telephone: (08) 43 5722 Facsimile: (08) 234 0321

Mr. Jeff Randell
Billiton Australia Ltd
PO Box 860
DEVONPORT
TAS 7310

F I N A L A N A L Y S I S R E P O R T

Your Order No: 11736/LJ30/JPR Our Job Number : 0AD3366

Samples received : 12-OCT-1990 Results reported : 28-NOV-1990
No. of samples : 216
Report comprises a cover sheet and pages 1 to 5

This report relates specifically to the samples tested in so far as that the samples as supplied are truly representative of the sample source.

Note:
If you have any enquiries please contact Miss Anne Reed quoting the above job number.

19801-07 Grid
19851-67 core
20096-20100 Soils
20106-20292

Approved Signatory:

John Waters
Technical Manager - Adelaide

MM Mr Jeff Randell Devonport

Report Codes:
N.A. - Not Analysed.
L.N.R. - Listed But Not Received.
I.S. - Insufficent Sample.

Distribution Codes:
CC - Carbon Copy
EM - Electronic Media
MM - Magnetic Media

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394091

CLASSIC LABORATORIES LTD

Job: 0AD3366
O/N: 11736/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
19801	0.25
19802	0.60
19803	0.25
19804	0.25
19805	0.25
19806	0.15
19807	0.20
19851	3.9
19852	22
19853	22
19854	4.9
19855	0.45
19856	0.50
19857	0.30
19858	0.40
19859	0.35
19860	0.10
19861	0.15
19862	0.20
19863	0.10
19864	0.25
19865	0.70
19866	0.30
19867	0.20
20096	0.35
20097	0.10
20098	0.05
20099	<0.05
20100	0.15
20106	17
20107	14
20108	18
20109	0.75
20110	0.35
20111	0.55
20112	1.50
20113	2.8
20114	14
20115	2.5
20116	0.50
20117	0.25
20118	0.25
20119	0.60
20120	0.35
20121	0.10
Units	ppb
DL	0.05
Scheme	BLEG2

CLASSIC LABORATORIES LTD

394092

Job: 0AD3366
O/N: 11736/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20122	0.20
20123	<0.05
20124	0.15
20125	<0.05
20126	0.15
20127	3.2
20128	4.0
20129	0.80
20130	1.45
20131	0.90
20132	3.2
20133	2.6
20134	2.3
20135	3.0
20136	4.5
20137	18
20138	20
20139	3.2
20140	1.55
20141	0.70
20142	0.30
20143	0.10
20144	0.15
20145	0.15
20146	0.20
20147	<0.05
20148	0.10
20149	0.40
20150	2.2
20151	2.0
20152	1.05
20153	1.05
20154	0.80
20155	1.35
20156	2.1
20157	2.1
20158	2.8
20159	1.90
20160	2.1
20161	0.90
20162	0.25
20163	0.20
20164	0.35
20165	0.30
20166	0.20
Units	ppb
DL	0.05
Scheme	BLEG2

Job: 0AD3366
O/N: 11736/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20167	0.15
20168	0.25
20169	0.15
20170	1.65
20171	1.40
20172	2.5
20173	4.1
20174	2.1
20175	1.85
20176	0.70
20177	1.20
20178	1.00
20179	0.90
20180	0.85
20181	0.45
20182	0.55
20183	0.35
20184	0.35
20185	0.10
20186	0.05
20187	0.10
20188	0.90
20189	2.3
20190	3.5
20191	0.55
20192	0.35
20193	3.9
20194	3.5
20195	0.35
20196	0.25
20197	0.20
20198	0.75
20199	0.15
20200	0.05
20201	4.2
20202	18
20203	5.5
20204	28
20205	28
20206	10
20207	22
20208	40
20209	75
20210	14
20211	9.0
Units	ppb
DL	0.05
Scheme	BLEG2

Job: OAD3366
O/N: 11736/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20212	1.65
20213	1.25
20214	4.6
20215	3.3
20216	5.5
20217	2.5
20218	4.4
20219	110
20220	9.5
20221	46
20222	34
20223	10
20224	4.4
20225	7.0
20226	8.5
20227	16
20228	42
20229	15
20230	17
20231	24
20232	40
20233	10
20234	2.7
20235	32
20236	10
20237	32
20238	17
20239	9.0
20240	6.5
20241	14
20242	8.5
20243	3.2
20244	3.9
20245	3.3
20246	12
20247	22
20248	15
20249	3.0
20250	1.85
20251	0.05
20252	2.1
20253	2.5
20254	3.6
20255	0.75
20256	2.2
Units	ppb
DL	0.05
Scheme	BLEG2

394095

CLASSIC LABORATORIES LTD

Job: OAD3366
O/N: 11736/LJ30/JPR

ANALYTICAL REPORT

Sample	Au
20257	1.55
20258	0.55
20259	2.2
20260	5.0
20261	3.0
20262	3.2
20263	3.7
20264	0.65
20265	0.70
20266	<0.05
20267	3.7
20268	7.0
20269	1.85
20270	1.70
20271	3.4
20272	2.8
20273	2.00
20274	0.90
20275	0.25
20276	0.85
20277	1.40
20278	1.05
20279	0.20
20280	0.20
20281	0.20
20282	0.35
20283	0.75
20284	0.55
20285	0.35
20286	0.75
20287	0.80
20288	0.40
20289	0.30
20290	0.45
20291	0.45
20292	0.10
Units	ppb
DL	0.05
Scheme	BLEG2

APPENDIX 2

The Geology, Geophysics and Mineralization of the
Golden Ridge Area, N.E. Tasmania
C.O.D.E.S. Publication 33

CENTRE FOR ORE DEPOSIT AND EXPLORATION STUDIES

A National Key Centre at the University of Tasmania

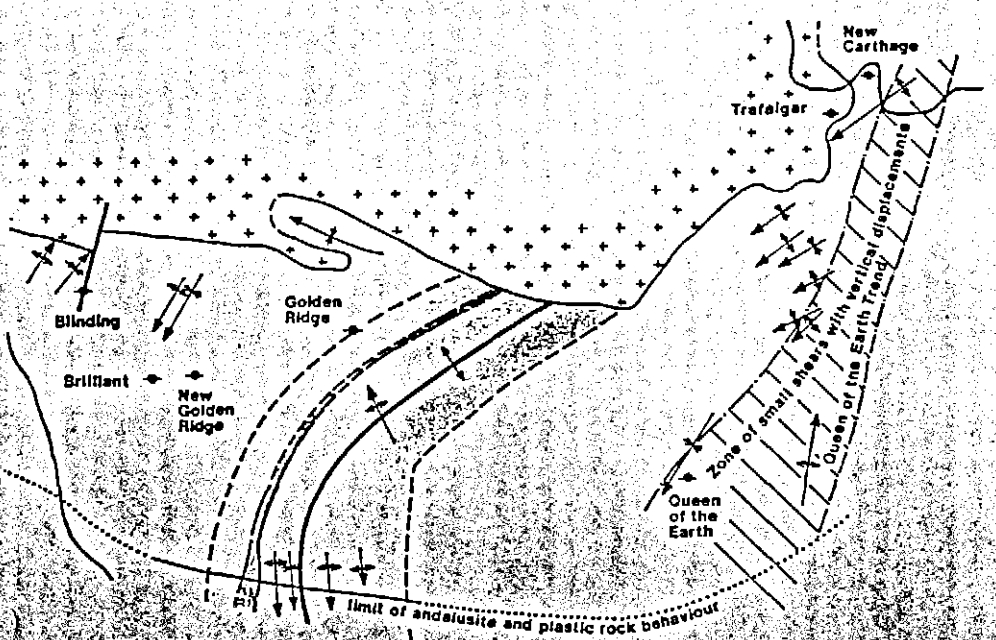
THE GEOLOGY, GEOPHYSICS AND MINERALISATION OF THE GOLDEN RIDGE AREA, NORTHEAST TASMANIA

Annual Report for Billiton Australia and Aureole Resources

October, 1990

Garry Davidson & Michael Roach

Centre for Ore Deposit & Exploration Studies



University of Tasmania
Hobart

CODES
PUBLICATION 33

1.0 STRUCTURAL GEOLOGY.....*Garry Davidson*

1.1 Insights into the Regional Structure

The two dominant geological elements in the Golden Ridge area (defined as an area bounded to the west and north by Hogans Road, and to the east by Beahrs Ck) are the southern margin of the Poimena pluton (Mt Pearson adamellite: 382.6 ± 1.5 Ma, (Cocker 1982)), and the intruded Devonian Mathinna Beds (Fig.1). Recent preliminary age-dating of graptolites found close to Hogans Rd by the author indicate the sediments may in fact be Silurian (M.Banks pers. comm., 1990). The granite in the area is deeply weathered, forming a deep recessive bowl; in this character it is unlike other plutons of the Blue Tier Batholith (e.g., Mt Pearson Pluton immediately to the east) which form high rocky terrains. Hornfelsing of the Mathinna Beds sediments has produced sharp resistant ridges adjacent to granite margins throughout N.E. Tasmania, and in this respect Golden Ridge duplicates the regional trend. However, it is not certain if the thermal effect of granite intrusion is confined to such ridges, or if lower but elevated metamorphic grades extend beyond the obvious topographic expression.

Stratigraphy in the Mathinna Beds in N.E.Tasmania is very poorly understood because of a lack of reliable marker beds, and a lack of detailed structural investigations. In this report detailed mapping has shown the Mathinna structure to be relatively simple, which together with the identification of a carbonaceous marker horizon, has permitted a broad understanding of the exposed succession.

A single anticline, referred to hereafter as the Golden Ridge Anticline, extends south from the Golden Ridge prospect area, exposing a 1.8 km succession of Mathinna Beds. The aproximate succession in the eastern limb of the anticline consists of:

>200 m — Quartzite

~180 m — Phyllite

~1240 m — Meta greywacke and quartzite (Ore host)

~180 m — Quartzite, finely laminated meta-siltstone, carbonaceous meta-phyllite and minor chert.

Within 1.3 km of the Golden Ridge granitoid, bedding in the Mathinna Beds strikes northeast-southwest, whereas south of this the regional north to northwest trend prevails. The Golden Ridge Anticline also traces out these trends, indicating it to be a pre-granite regional fold reoriented during granite intrusion. Similar reorientation has been noted by Turner & Calver (1987) for sediments around a pluton in the Elephant Pass area.

A second important structural feature in the area is a northeast-striking zone of small shears and faults, commencing 200 m east of the most eastern tip of the Golden Ridge

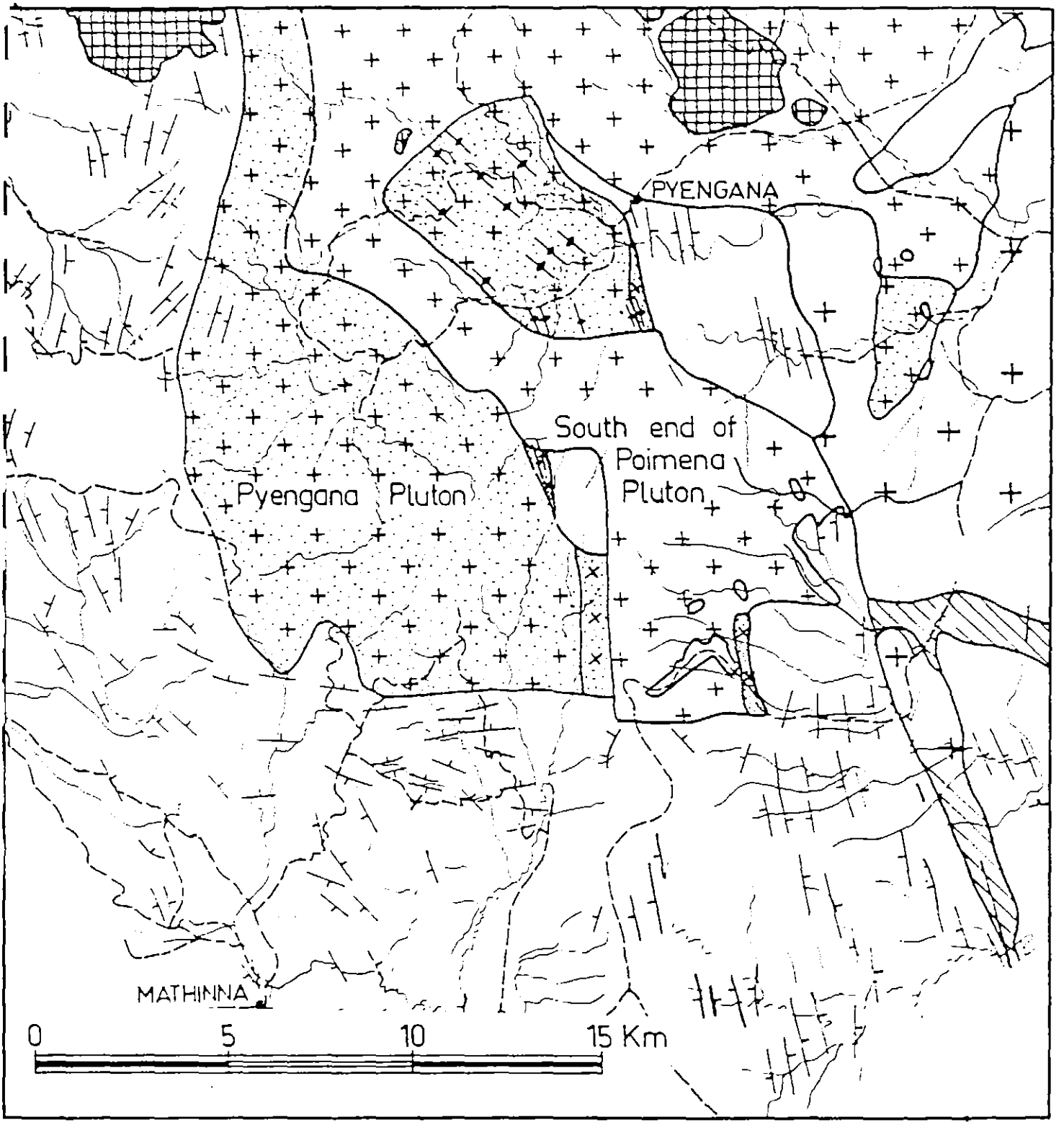


Figure 1 Regional geology of the Mathinna-Pyengana area, NE Tasmania.

5 cm

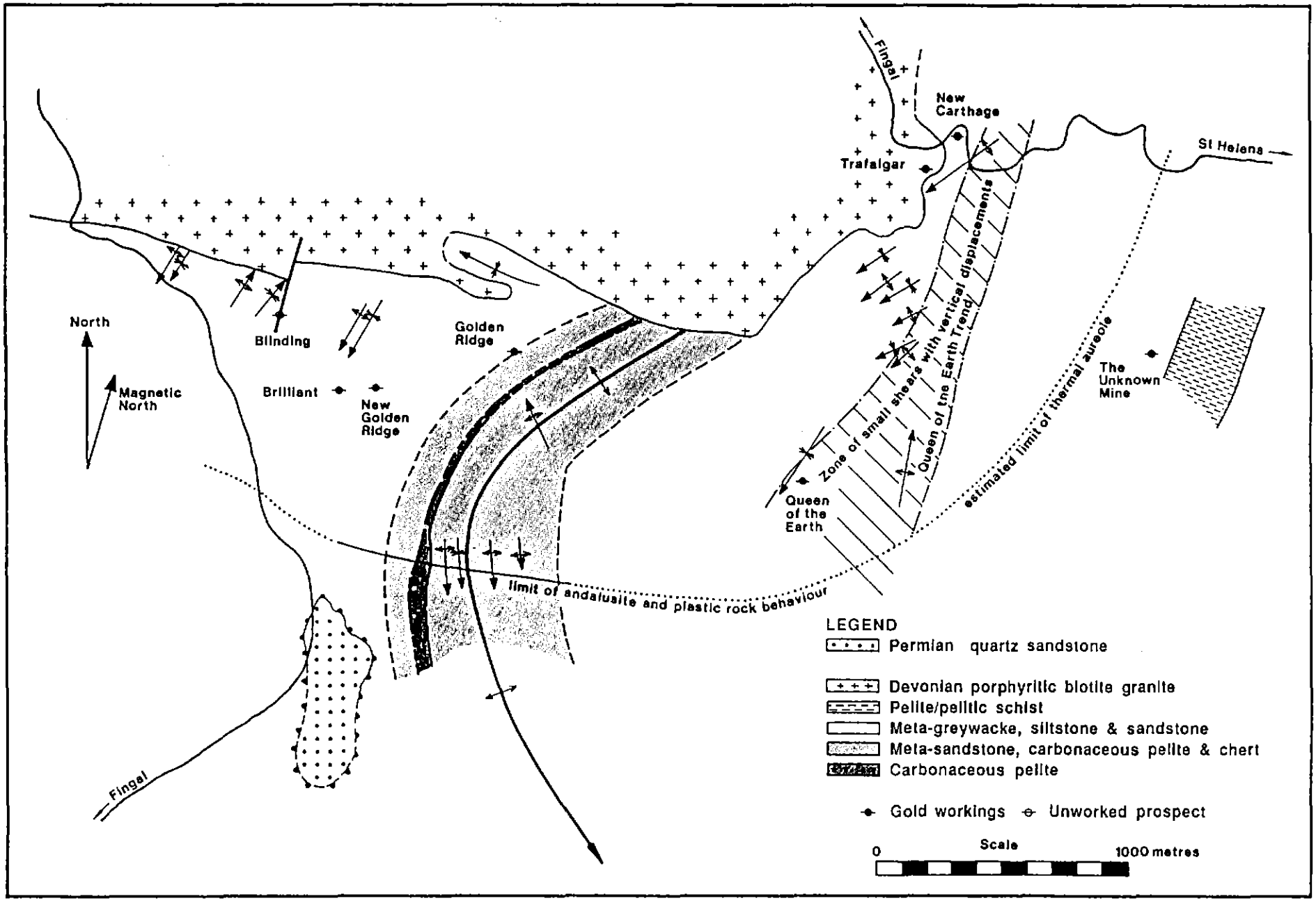


Figure 2 Summary geology of the Golden Ridge area.

granitoid. It is not certain whether this feature solely relates to granite intrusion, or if it is older and reoriented.

1.2 Extent of the Granite Aureole

The thermal aureole related to granite intrusion is thought to be considerably wider that that based on the topographic expression, and delineated on the St Helens 1:50 000 map sheet. The criteria used for this assessment are the extent of:

(1) metamorphic minerals such as cordierite and andalusite;

(2) recrystallised quartz resulting in conchoidal fracture in quartzites;

(2) plastic deformation in the Mathinna Beds imposed on the regional deformation.

These criteria indicate a limit of 1.3 km for the aureole south of Brilliant, which encompasses all known gold prospects except "The Unknown Mine". This limit is not well-defined in the eastern part of the area. Cordierite "spotting" is mainly confined to within 800 m of the exposed granite outcrop.

Other features are observed in the Mathinna Beds as the granite contact is approached. Within aproximately 100 m, coarse (0.5 to 2 mm long) flakes of muscovite occur in a decussate fabric. At present it is not understood if this is a hydrothermal-metasomatic effect, or isochemical metamorphism, but the lack of obvious K_2O enrichment in a limited sample set supports the latter. A second feature within 50 m of the contact are thin veins of pegmatitic quartz, characterised by milky feldspar and very coarse muscovite, infiltrating bedding and fractures. These veins can contain very low gold values (14 & 41 ppb). A less reliable feature within 20 m of the granite contact is pervasive hydrothermal alteration resulting (in the weathered state) in a ferruginous clay-rich rock bereft of fabric. Concentrations of sulphide can occur on the granite-sediment boundary. The adjacent granite is variably altered, although it is not clear whether hydrothermal or supergene processes are to blame.

In summary, the host-rock changes within the granite aureole are:

Distance from Granite	*Feature*
0 – 1 m	Sulphide concentrations: uncommon to rare (bear in mind that only 5 granite contacts are exposed).
0 – 50 m	Pegmatitic quartz veins.
0 – 100 m	Coarse-grained disseminated muscovite.
0 – ~800 m	Cordierite occurs.
0 – ~ 1.3 km	Andalusite occurs.
0 – 1.3 km	Plastic refolding of older folds.
1.3 km – ?	Brittle behavior around aureole.

1.3 Mechanism of Intrusion of the Golden Ridge Granitoid

The known possible mechanisms by which host-rocks permit granitoid intrusion are;

(1) stoping involving the brittle fracture of all wall-rocks and the subsequent sinking or assimilation of enclosed blocks;

(2) reactive emplacement involving melting of the roof and crystallisation on the pluton floor;

(3) horsting of a cap zone above the granite;

(4) 'lateral magmatic wedging' in which wall-rocks are plastically folded and/or shouldered aside.

(1), (3) and (4) are all documented for the intrusion of the Blue Tier Batholith (Groves 1977).

The southern portion of the Poimena adamellite (Golden Ridge area) is envisaged by Gee & Groves (1971) to have intruded by dilation and fragmentation of the Pyengana Pluton granodiorites, as evidenced by matching dyke-wall irregularities. A maximum lateral dialtion of 4.5 km in the horizontal plane is indicated. The southern margin of the Poimena pluton, refered to here as the Golden Ridge granitoid, was considered to be discordant to the country rock and characterised by rectangular irregularities and the absence of marginal deformation. By contrast, the western portion of the Pyengana Pluton has a rectangular contact which is both perpendicular and parallel to the regional north-south strike of pre-existing structures. Fold planes, cleavage and bedding within the 2 km wide thermal aureole wrap closely around the granite contact. It is thus envisaged by Gee & Groves (1971) that the Pyengana Pluton intruded initially by stoping blocks which broke along fractures perpendicular and parallel to the regional structural fabric, subsequently involved plastic deformation of the wall-rocks to accomodate continuing pluton inflation.

From detailed mapping in the area, it is apparent that *wall-rock deformation did in fact characterise the southern margin of the area mapped formerly as part of the Poimena Pluton*. Under the hypothesis of Gee & Groves (1971), there arises the intriguing possibility that this deformation actually relates to the earlier Pyengana intrusion, and also that mineralisation in these folded wall-rocks might have derived from the Pyengana rather that the later Poimena intrusion. This would be possible if dilation and intrusion of the Poimena terminated at a hypothetical east-west transfer fault close to the present southern granite margin. However, the geophysical (M.Roach, this paper) and geochemical evidence indicates that the granitoid adjacent to Golden Ridge is likely to be a separate pluton, unrelated to either the Pyengana or Poimena plutons, and was the likely source of gold mineralisation. It will henceforth be refered to as the Golden Ridge pluton.

In detail the intrusion of the Golden Ridge pluton involved:

(1) Dilation and stoping along an east-west fracture system, and along the north-south cleavage/bedding trends, to form the initial north and east-trending eastern and southern margins. A vertical component of the intrusion movement may have been accomodated by faulting within the Queen of the Earth trend (Fig. 2).

(2) Inflation of the pluton laterally, resulting in the imposition of dextral shear on the plastically deforming metamorphic aureole. Very little vertical movement is envisaged at this time because there is no observed steepening of the Golden Ridge Anticline approaching the granite contact. A second possibility exists that the plastic distortion within the aureole is related to a previous granite intrusion, but this is difficult to prove.

(3) A final rapid inflation which imposed high strain-rates was accomodated within the brittle deformation field, resulting in stoping of wall-rocks. This resulted in the intrusion of the Golden Ridge Anticline by granite, and the widespread fracturing and jointing within the aureole associated with mineralisation.

2.0 GRANITE GEOCHEMISTRY.....*Garry Davidson*

Eleven samples were analysed to evaluate the possibility that the granitoid intruding the Golden Ridge sediments might be chemically distinct. Locations of these samples are shown in figure 3; analyses were carried out at the University of Tasmania.

In mapping the Blue Tier Batholith, Groves (1977) considered the Golden Ridge granitoid to be part of the Poimena adamellite. Williams et al. (1989) regards the biotite adamellite in the Golden Ridge area as a separate pluton, on the basis of mapping, but neverthelss part of the Poimena composite. In terms of petrographic affinities, the Pyengana is an 'I'-type suite with magnetite series mineralogy (Ishahara 1981), whereas the Poimena has both 'I' and 'S'-type characteristics, and is dominantly ilmenite-bearing (Williams et al. 1989). Cocker (1982) and Williams et al. (1989) argue that the Blue Tier Batholith granites "derived from a number of distinct magmas", which were generated by the melting of heterogeneous crust.

Chemical data for the Golden Ridge granitoid is presented in table 1 and Figures 4 to 9. Data from the Pyengana and Poimena plutons are also included for comparison. These figures suggest that in terms of Mg, Fe, Zr and Nb, the Golden Ridge granitoid is chemically distinct from both the Poimena and the Pyengana plutons. In figures 4 to 7, total Fe as FeO has been employed as an indicator of fractional crystallisation. The coherent linear trends formed by Golden Ridge data, parallel to that of the other plutons, confirms that fractional crystallisation was an important control on granitoid chemistry. This is with the exception of sample HR47a, obtained from a sill on the granite-Mathinna Beds contact, which is strongly altered, reflected in very marked depletion of Na, Ca, K, Mg and Fe.

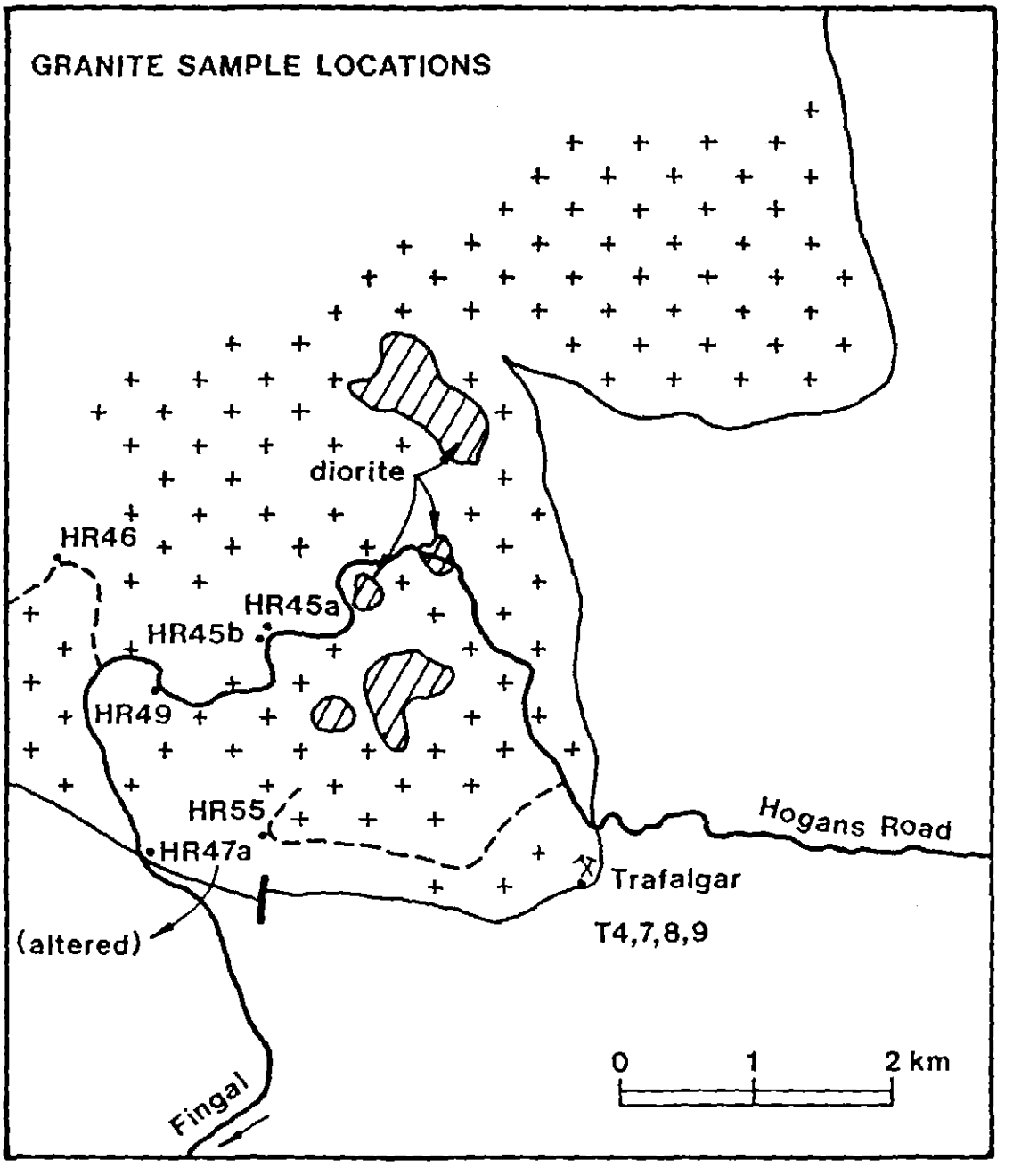


Figure 3 Granite sample locations used for major and trace element geochemistry.

5 cm

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	Sample	SiO2	TiO2	Al2O3	Fe2O3	FeO tot	MnO	MgO	CaO	Na2O	K2O	P2O5	Loss	Total	Zn	Cu	Ni	Cr	V	Ba	Sc	Pb	Th	As	Mo	Nb	Zr	Y	Sr	Rb
2	T4	68.18	0.55	13.19	4.02	3.62	0.08	1.4	2.77	2.4	3.03	0.15	4.17	99.94	47	37	7	27	69	621	13	23	9	89	<2	10.5	182.9	28.6	137.6	112
3	T7	66.57	0.66	14.01	5.14	4.62	0.1	1.67	3.27	2.19	3.17	0.17	2.57	99.52	69	9	9	30	79	638	19	16	11	3	<2	12.2	201.6	31.7	170.8	149.7
4	T8	67.44	0.54	14.62	3.93	3.53	0.07	1.36	2.84	2.58	3.26	0.15	2.99	99.78	56	10	8	29	71	570	15	16	13	4	<2	10.8	186.3	34.5	155.8	156.5
5	T9	67.97	0.63	13.54	4.7	4.23	0.08	1.61	2.16	3.07	2.79	0.17	2.98	99.7	65	11	9	30	76	526	17	17	7	25	<2	12.2	205.3	29.5	187.9	132.4
6	HR45a	70.82	0.41	13.94	3.62	3.26	0.07	1.14	2.18	2.2	3.28	0.1	1.9	99.66	54	8	7	24	58	472	11	21	7	1	<2	10.2	137.1	23.7	147.8	163.5
7	HR45b	70.8	0.38	14.07	3.3	2.97	0.06	1.07	2.84	2.5	3.13	0.13	1.16	99.44	52	6	6	22	55	455	13	20	12	1	<2	8.6	147.8	32.5	162.3	145.4
8	HR46	70.73	0.41	13.94	3.5	3.15	0.07	1.18	1.73	2	3.66	0.1	2.67	99.99	51	6	8	22	64	608	14	22	13	1	<2	10.1	154.1	32	125.9	170.1
9	HR47a	75.63	0.28	14.73	1.27	1.14	0.01	0.3	0.02	0.09	2.64	0.11	4.78	100.06	17	13	8	34	56	294	15	25	17	30	<2	8.9	148.5	40.2	29.4	109.5
10	HR49	70.64	0.44	13.78	3.79	3.41	0.07	1.39	1.89	2.09	3.78	0.11	1.92	99.88	55	7	7	26	63	615	12	22	9	1	<2	9.1	139.9	25	140.8	173.5
11	HR55	67.65	0.62	14.93	4.95	4.45	0.09	1.62	3	2.42	3.27	0.24	1.33	100.12	75	4	12	35	80	690	18	18	17	1	<2	14.1	205.3	37.3	179.6	173.7
12	HR56														140			35		340	15			37						100

Table 1 Geochemistry of granite samples from the Golden Ridge area; locations in fig. 3.

Figures 4-9 A comparison between Golden Ridge, Poimena and Pyengana granite chemistry.

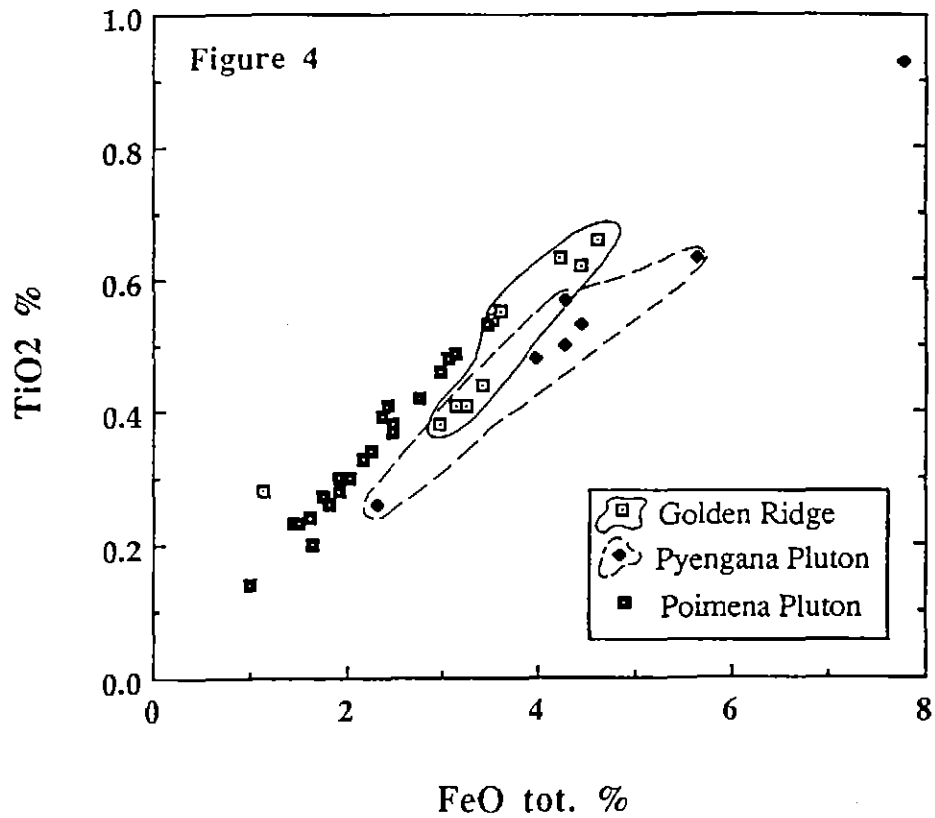


Figure 5

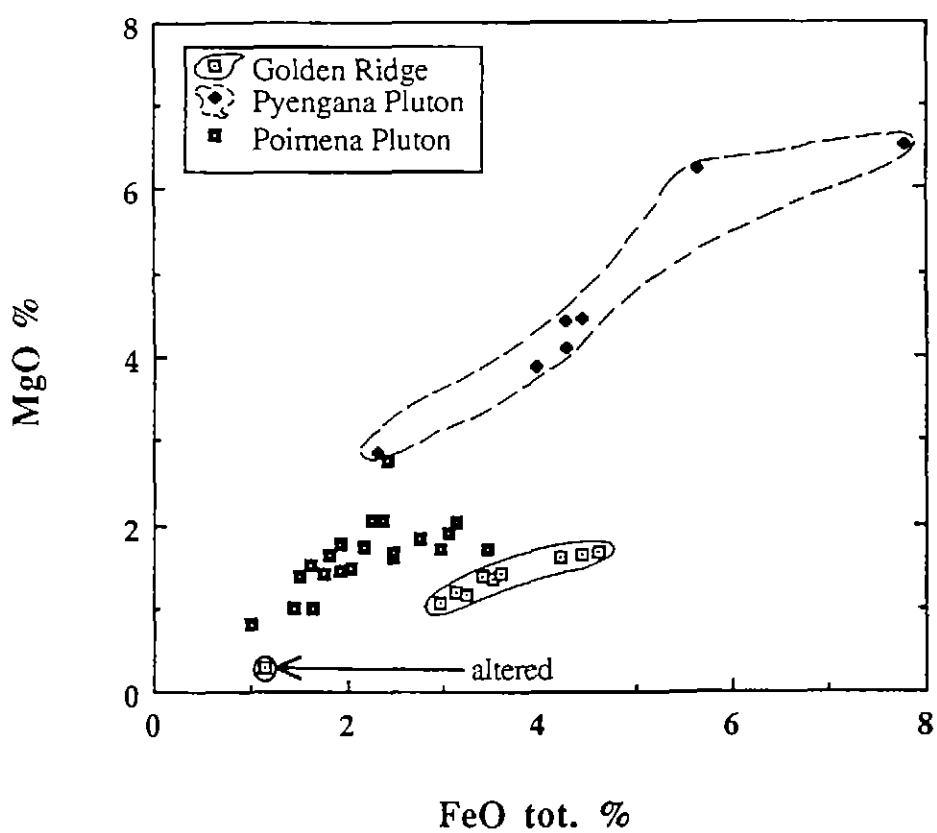


Figure 6

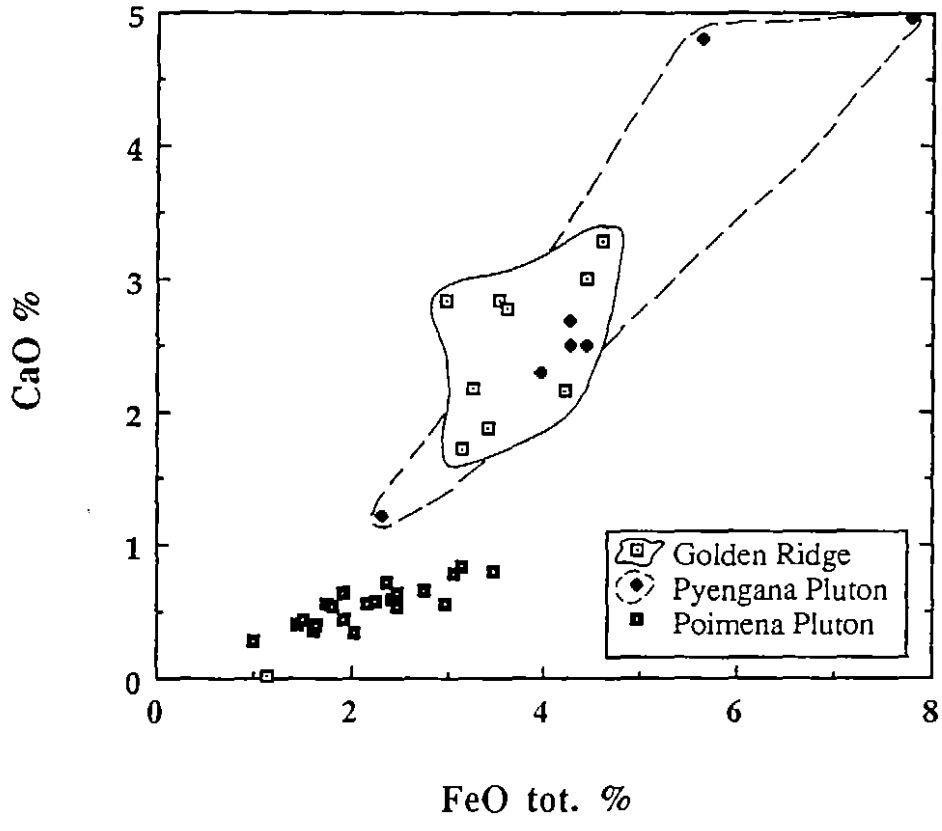


Figure 7

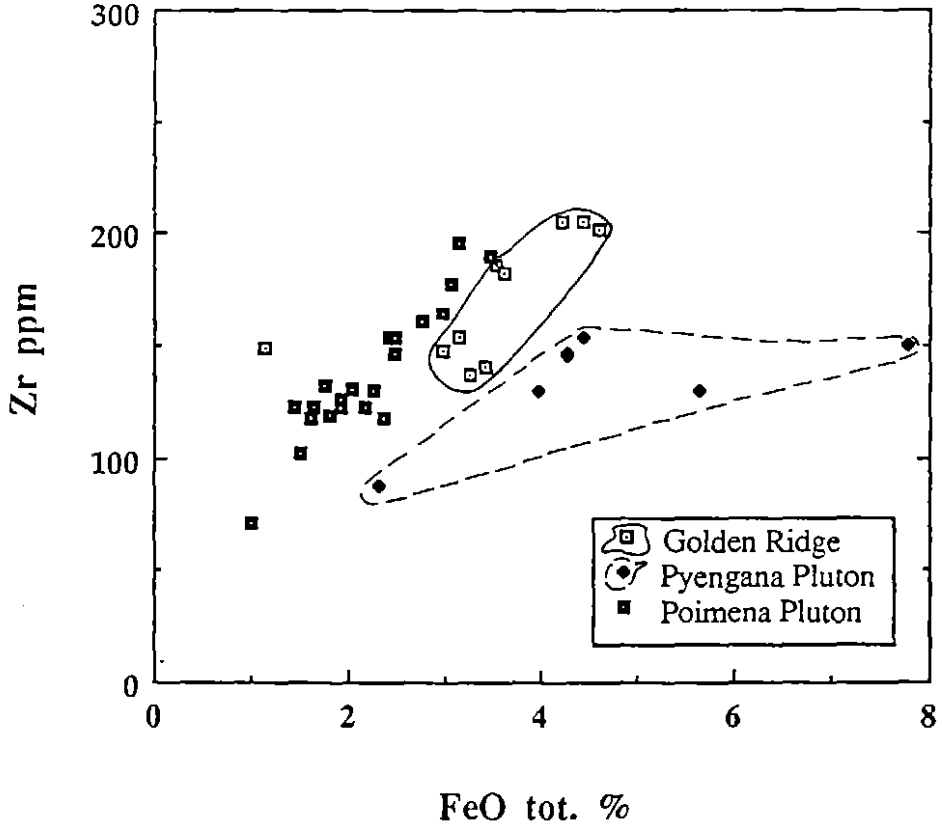


Figure 8

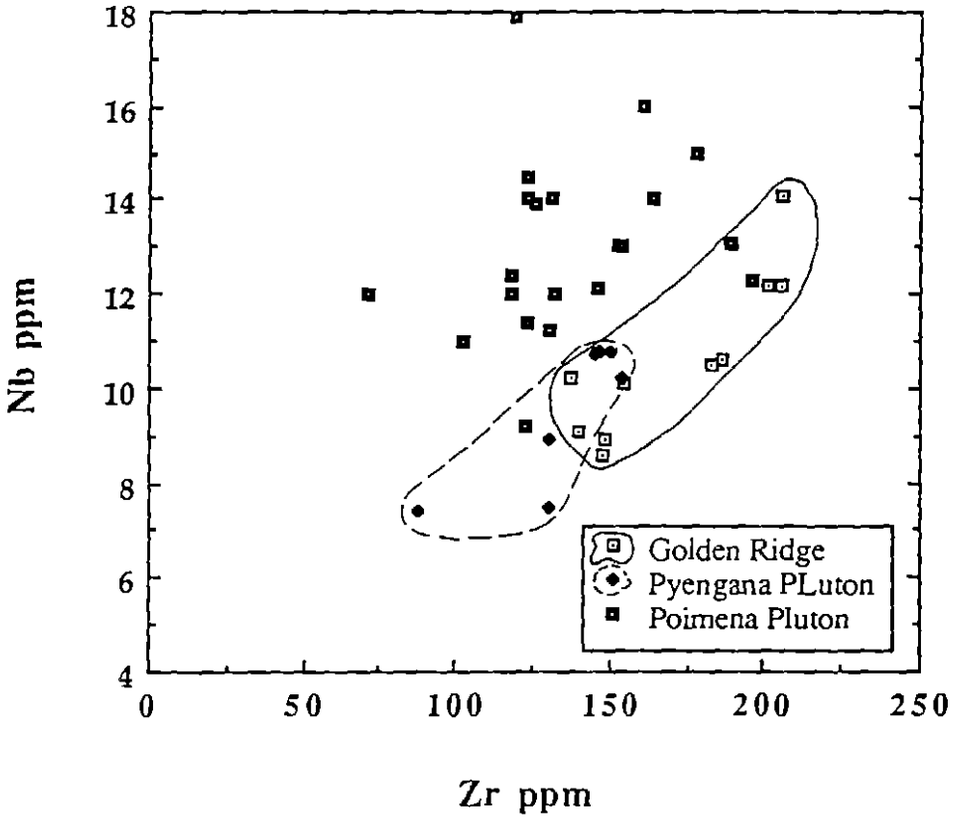
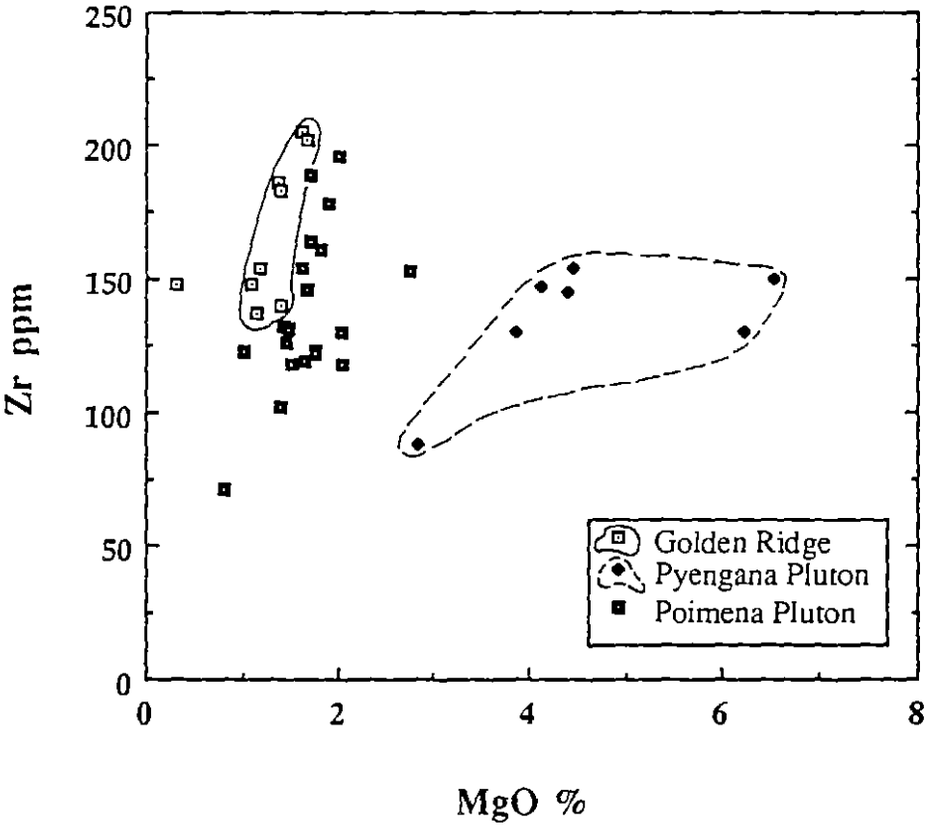


Figure 9



In several of the variation diagrams (Nb-Zr, Ca-Fe, Ti-Fe), the Golden Ridge granitoid data is coincident with that of the Pyengana granodiorite. This is interpreted as the derivation of both magmas from the melting of similar source rocks. However, Mg and Zr contents are distinctly different and do not permit the derivation of the Golden Ridge magma from the Pyengana by fractional crystallisation. This can likewise be readily concluded for the Poimena Pluton.

The ramifications of this conclusion are best considered in company with the geophysical evidence (M.Roach, this paper). Magnetically the Golden Ridge granitoid forms part of the non-magnetic Poimena Adamellite, and hence is likely also to be an ilmenite series magma. The two have distinctly different densities. Without the geochemistry, such density differences might be regarded as products of fractional crystallisation within a single granite. With the geochemistry, and the magnetic evidence of truncation of the Pyengana granodiorite, it can be concluded that gold-bearing fluids emanated from a chemically distinct pluton which cannot be related to the adjacent plutons by fractionation. The timing of intrusion of the Golden Ridge pluton with respect to the Poimena is presently uncertain, and can only be determined by further mapping, geophysical measurement, and geochemical analysis.

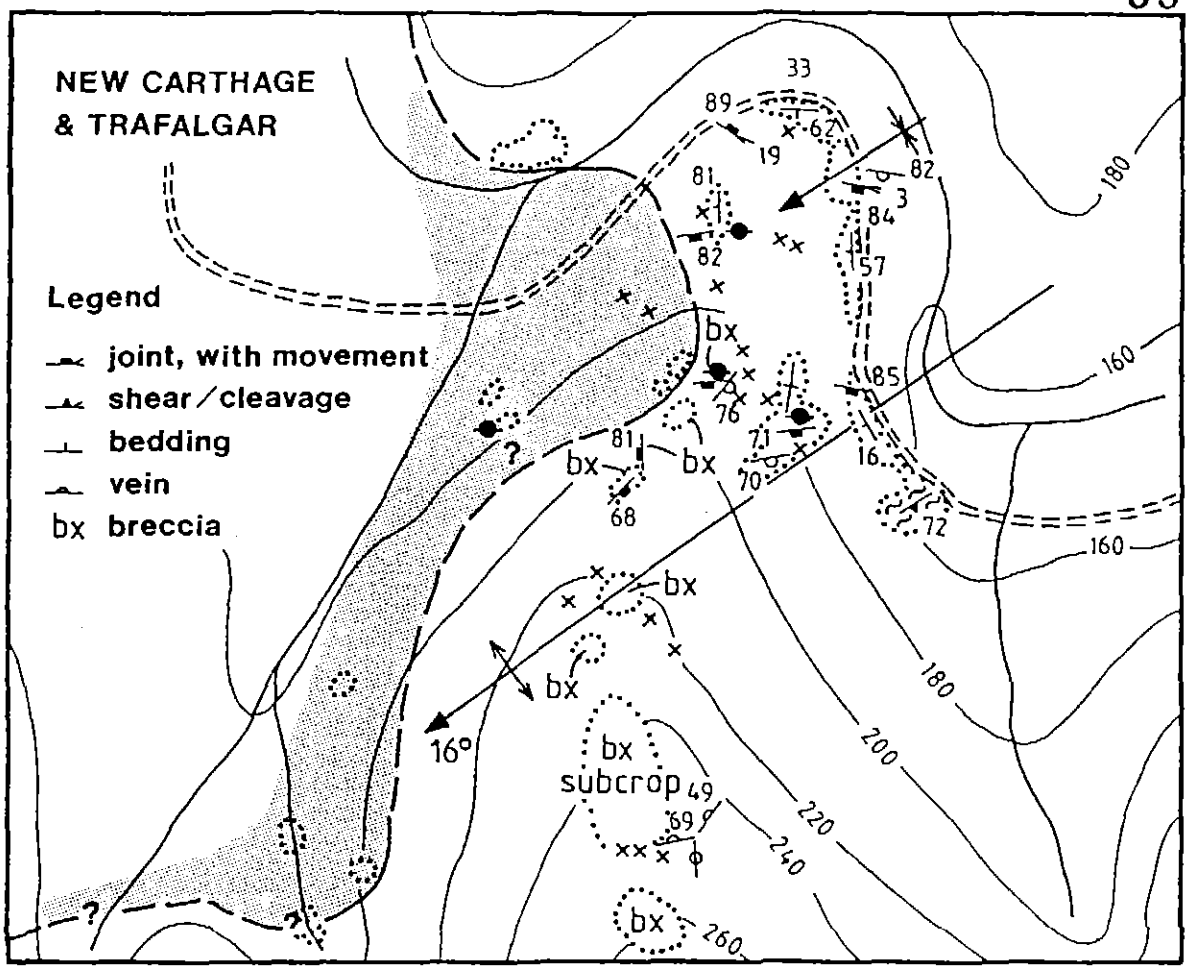
3.0 ORE GEOLOGY.....*Garry Davidson*

3.1 Prospect Geology

There are eight historically mined prospects in and around the Golden Ridge pluton (Double Event, Trafalgar, New Carthage, Queen of the Earth, Golden Ridge, New Golden Ridge, Brilliant, and the Unknown Mine (historical name uncertain)), as well as a prospect recently identified by the current research program (Blinding). Double Event — exact location still unknown!— and Trafalgar lie within the granite, whereas all of the others, with the exception of the Unknown Mine, lie within the thermal aureole. The geology of these prospects is very diverse, but they share one feature in common — each is associated with local folding which is anomalous amongst the uniform dips of the regional Golden Ridge Anticline. It is likely that at least some of these minor folds developed during granite intrusion because they are more prevalent towards the granite contact, but some may also be reoriented older folds. It is mainly not possible to discriminate pre- and syn-granite folds because cleavage is difficult to identify within the aureole, and because most folds in the aureole are within 15° of the average plunge of 12°/215°.

3.1.1 *Trafalgar – New Carthage*

These prospects (Fig. 10a) occur within 100 m of one another on a bend of Beahrs Ck.. In the Trafalgar mulloch, 1 – 4 cm wide quartz-arsenopyrite veins cut cleanly across a granite host. The trend of this mineralistion is uncertain.



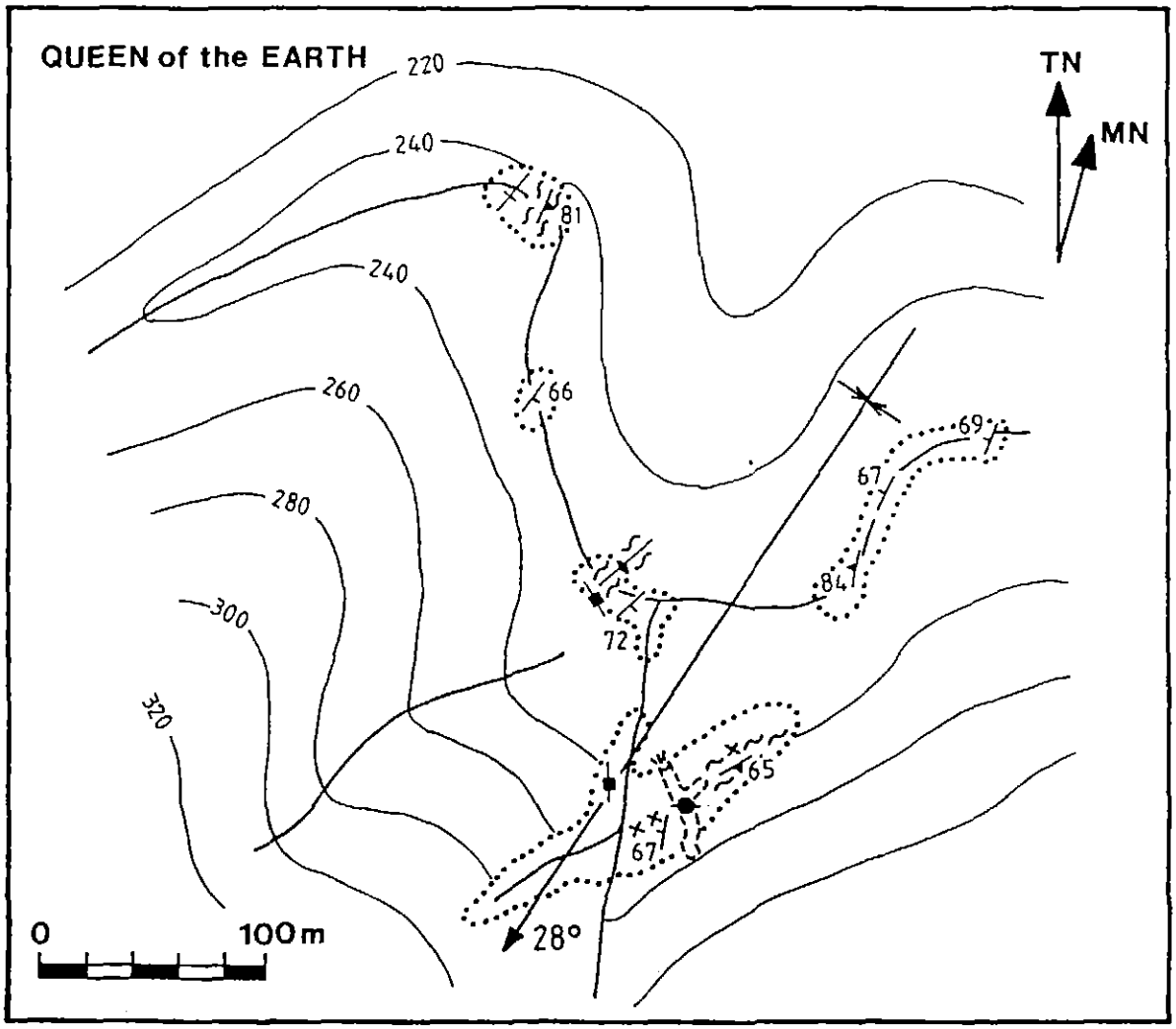


Figure 10a & b Detailed geology of the New Carthage and Queen of the Earth gold

Recent mapping indicates that granite occurs within 8 m of the New Carthage workings. These consist of two unlinked shafts, a small adit, and numerous explorative pits. The axis of the regional Golden Ridge Anticline trends through the propect, but at least one and perhaps several smaller folds occur in the mineralised area. Jointing of the hornfels is very common in orientations perpendicular and sub-parallel to the granite contact; some are filled by medium-grained slivers of pegmatitic mineralised quartz. Disseminated mineralisation also occurs in distinct breccia zones commonly confined within distinct joint-bound blocks of host-rock and quartz, cemented by fine quartz and iron-oxides. A large sub-cropping area of such breccia extends from the present workings at aproximately the 200 m contour, discontinuously up to the 280 m contour.

In the first major creek south of the prospect, the only granite-sediment contact in the area consisted of 30 to 50 cm of gossanous chloritised material which contained 0.4 ppm Au and 0.23 % As.

3.1.2 *The Unknown Mine*

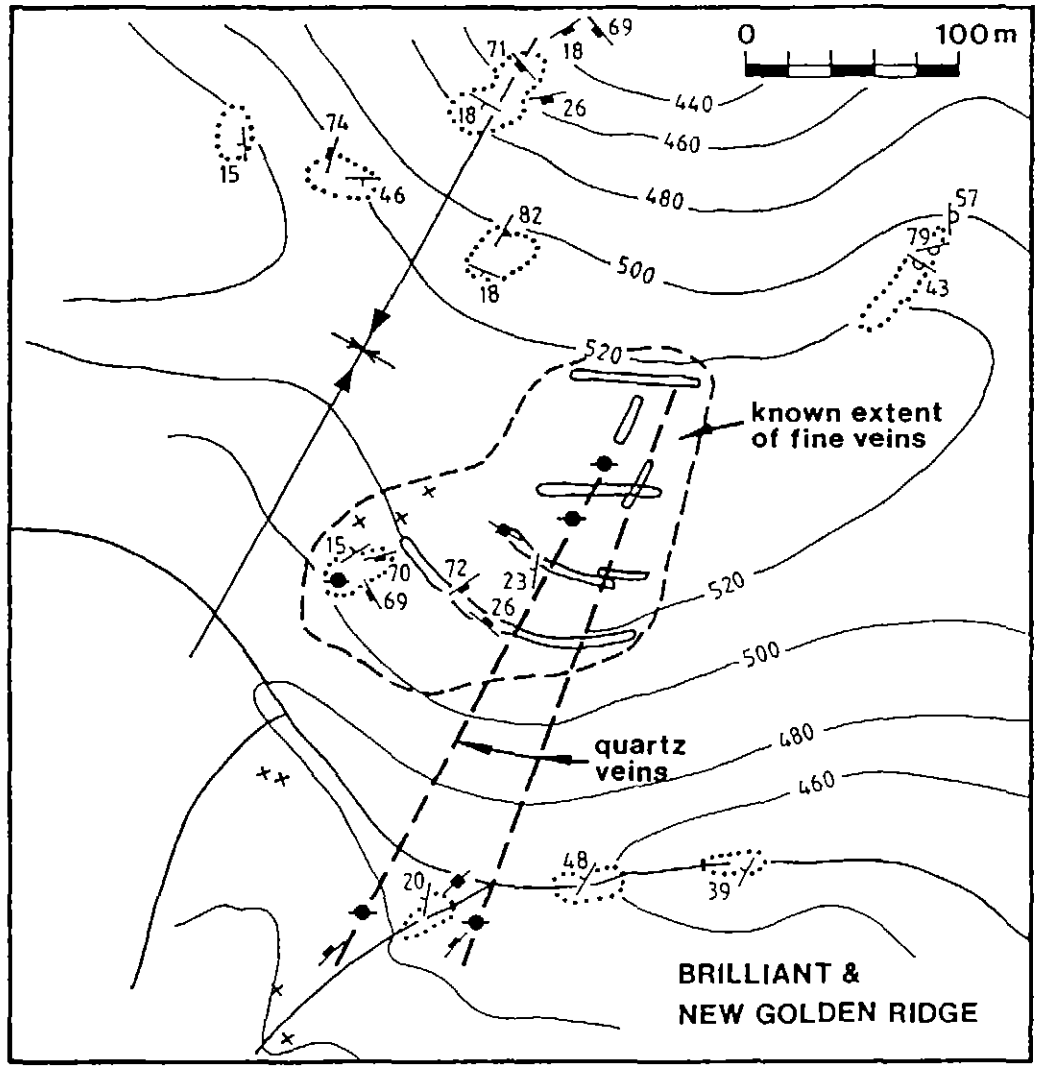
A deep shaft (50 - 60 ft.) has been driven on a steeply south plunging minor fold (65°/175°). The outcrops within 200 m contain abundant kinks and kink-related vein quartz, and the distinctly blue quartz with minor arsenopyrite and pyrite which characterises the lode may derive from such kink-related dilation. The mineralisation also occurs close (20 m) to an outcropping N/S oriented narrow shear. The abundance of kinking is evidence that The Unknown Mine is beyond the limit of plastic deformation in the granite aureole, but still within a brittle-ductile transition zone.

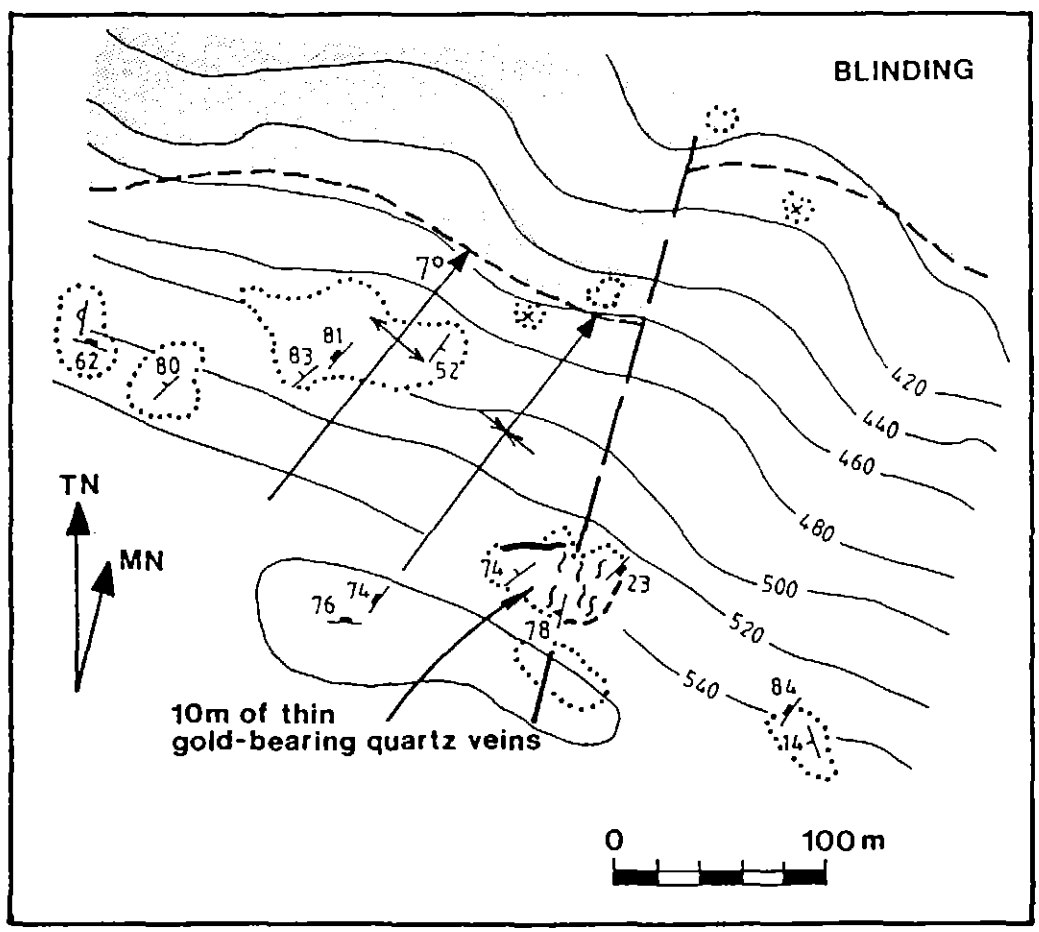
3.1.3 *Queen of the Earth*

Queen of the Earth is a shear-hosted vein complex closely associated with a syncline-anticline pair (Fig. 10b). Chlorite alteration selvedges characterise some quartz veins. The mineralisation lies within a 500 m wide regional zone of small faults and shears which accomodated some host-rock horsting during the intrusion of the Golden Ridge pluton. It is postulated that this mineralising event preceded the general lateral pluton inflation, which raises the possibility that the zone has been reoriented.

3.1.4 *Golden Ridge*

Golden Ridge differs form all other propects in that there is no evidence of medium-scale ductile structures which might have been instrumental in ore localisation. From the limited evidence available from an aligned series of shafts, trenches and pits, gold occurs in a single vein set parallel to bedding, with minor thickness fluctuations attributable to small scale subtle cross-folds or boudinage. This description essentially tallies with that of


0
100m
440
460
480
500
520
known extent
of fine veins
quartz
veins
BRILLIANT &
NEW GOLDEN RIDGE


BLINDING
TN
MN
10m of thin
gold-bearing quartz veins
0
100m
420
440
460
480
500
520
540

5 cm

Twelvetrees (1912). Billiton trenches indicate that host-rocks within 50 m contain thin ferruginous joints which are at least superficially similar to those of the Brilliant prospect.

3.1.5 *Brilliant – New Golden Ridge*

"Brilliant" is part of a large zone of low grade gold mineralisation hosted by numerous small faults, veins and joints, presently known to be 150 m across at its widest dimension, and thus the most promising prospect of the area. This zone is transected by two discontinous quartz veins on which pits and shafts of the New Golden Ridge prospect are sited (Fig. 11a). The known zone of fracturing coincides with a marked shallowing in dip of the west-dipping limb of the Golden Ridge Anticline, immediately adjacent to a small doubly-plunging syncline-anticline pair. The latter is also notably severely jointed in outcrops on the steep northern side of the ridge, 150 m from the workings. Joint and vein orientations are as yet poorly understood, although at Brilliant the most consistent direction (the axis of the open cut) is ~45° to the fold axes.

3.1.6 *Blinding*

A 10 m wide zone of intense quartz and minor sulphide veining occurs close to the ridge crest, 500 m west of New Golden Ridge. A 1 m wide chip sample from this area contained 4.8 ppm Au. The main foliation in the zone aligns with an offset in the granite margin, a left lateral strikeslip fault orthogonal to the contact. Although thin (<1 cm) veins of quartz fill the steep foliation, gold and sulphides are reside mainly in cross-cutting flatly-dipping gossanous joints.

A flatly east-dipping reverse fault off-sets the main fault zone at the base of the outcrop, with unknown displacement. It contains low-grade Au (0.3 ppm), and is similar to a low angle fault exposed in the Brilliant underground workings.

3.2 Metal Zonation

A limited number of samples from four of the main propects reveals a distinct pattern of metal distribution (Table 2). Two propects close to or within the granite (Trafalgar and environs) exhibit high to very high As values (0.24 – 5.65%). The shear-hosted Queen of the Earth ore zone, ~600 m above the granite contact, is also strongly arseniferous.

In contrast, the collection of prospects (Brilliant, Brilliant South, and Blinding) in the western field area are severely depleted in As, which ranges between 2.2 and 35 ppm, from both surface and underground samples. These propspects are also notably depleted in Sb (0.5 – 1.6 ppm) compared to Trafalgar and Queen of the Earth (3.3 – 29.7 ppm), whereas Zn and Co show no systematic variation between the two groups.

More work needs to be completed to understand this geochemical difference between the prospect groups. Is the difference a function of distance from the granite, or could it be

a function of oxidation state of the host-rocks, given the sensitiviy of arsenopyrite to fO_2? Is it related to the ore fluid temperature, or more to the differences in orebody style, i.e., quartz veins with low water to rock ratios, versus network-jointed ores in which W/R ratios must have been very high.?

Prospect	Co ppm	As	Zn ppm	Sb ppm	Au ppm
Queen of the Earth	5.7	1.73%	240	18.0	0.64
Granite contact gossan	1.1	0.24%	110	3.3	0.30
Trafalgar veins	20.0	3.67%	210	8.6	4.22
	30.0	5.65%	510	29.7	8.85
Brilliant	5.1	6 ppm	160	0.9	0.85
	5.1	15 ppm	130	1.2	3.04
	18.1	15 ppm	120	1.2	0.67
	26.0	10 ppm	200	0.7	8.22
	1.1	2 ppm	<100	0.5	2.73
Brilliant South	1.0	24 ppm	<100	0.5	0.57
Blinding	5.6	35 ppm	220	0.8	0.34
	7.6	17 ppm	140	0.8	0.23
	7.6	18	140	1.6	4.86
Quartz vein 200m east of Brilliant	2.2	2.8	<100	0.5	0.30

Table 2 *Geochemistry of individual rock-chipped samples from Golden Ridge prospects.*

3.3 Alteration

In general the Mathinna Beds adjacent to mineralised veins are only locally altered, but this alteration is imposed on a previously hornfelsed assemblage. Mild sericitisation is the most commonly observed phenomena within 10 to 15 metres of some propects, but local carbonation and chloritisation has been observed at Queen of the Earth, and silicification at Brilliant and Blinding. Disseminated carbonate and sericite is observed within a few centimetres of Trafalgar veins, but otherwise the enclosing granite is remarkably fresh.

Chemical alteration of granite was noted 250 m west of Trafalgar associated with a gossanous contact: K_2O values of 7.0 and 7.2 % here indicate substantial potassic addition, although the rocks were also very weathered. As previously mentioned, granite in the Hogans Rd. cutting west of Blinding also proved to be alkali-depleted and silica-enriched, but quartz veins on the sill margin only have low gold values (14 ppb).

Arsenic values greater than ~40 ppm are characteristic of altered sediment and granite close to mineralisation, but the extent of such enrichment is not known. Low grade granite

alteration may in fact be very extensive, given the recessive topography of the southern edge of the Golden Ridge pluton.

3.4 Fluid Inclusions

The main progress in the study of fluid inclusions from the mineralised prospects was a decrepitation analysis obtained from the Bureau of Mineral Resources in August. In this procedure mineralised quartz samples from Trafalgar and Blinding were crushed to 80 mesh, washed with concentrated hydrochloric acid overnight, and subsequently with an organic solvent. The samples were then heated gradually to 600° C, with coeval analysis of the decrepitated gases and liquids. A sequential record (Fig. 12) of the composition of fluid inclusion populations which decrepitate below 600° C was obtained. A second stage of the work was the analysis of individual inclusions by Raman spectroscopy, to provide specific compositional data.

This work found that fluid inclusions in the mineralised veins at both sites were dominated by H_2O and CH_4, with lesser amounts of complex hydrocarbons and nitrogen. The abundance of reduced gases is evidence that these fluids circulated within the wall-rocks of the granite and scavenged complex sedimentary hydrocarbons.

Further work is necessary to separate individual inclusion populations.

3.5 The Relationship between Ore Fluids and the Golden Ridge Pluton

There is strong evidence that gold-rich fluids were derived from the Golden Ridge pluton;

(1) All the gold mines in the area occur within 2 km of the granite, mainly within the plastic deformation aureole;

(2) Quartz veins approaching the granite contain pegmatitic sericite and feldspar;

(3) Gold and arsenic-rich veining and alteration occurs on the granite/sediment contact, and within the granite;

(4) Carbon and sulphur isotope values at Trafalgar indicate a dominantly magmatic origin for these components.

It is concluded that gold, arsenic and other metals were derived from the fractionating Golden Ridge pluton, although some sulphur was obtained from the Mathinna Beds wall-rocks (sulphur isotope evidence presented in quarterly report 1), and the fluids were buffered to a reduced oxidation state by sedimentary carbon.

All mineralisation, with the notable exception of Queen of the Earth, developed in locally brittle structures after a period of ductile deformation within the granite aureole. Possibly the brittle behaviour related to an episode of rapid pluton inflation related to deeper magma injection; it is difficult to relate it to hydrostatic fracturing of the granite cap-rock because observed fault-slicks and displacements indicate only lateral movements. Brittle

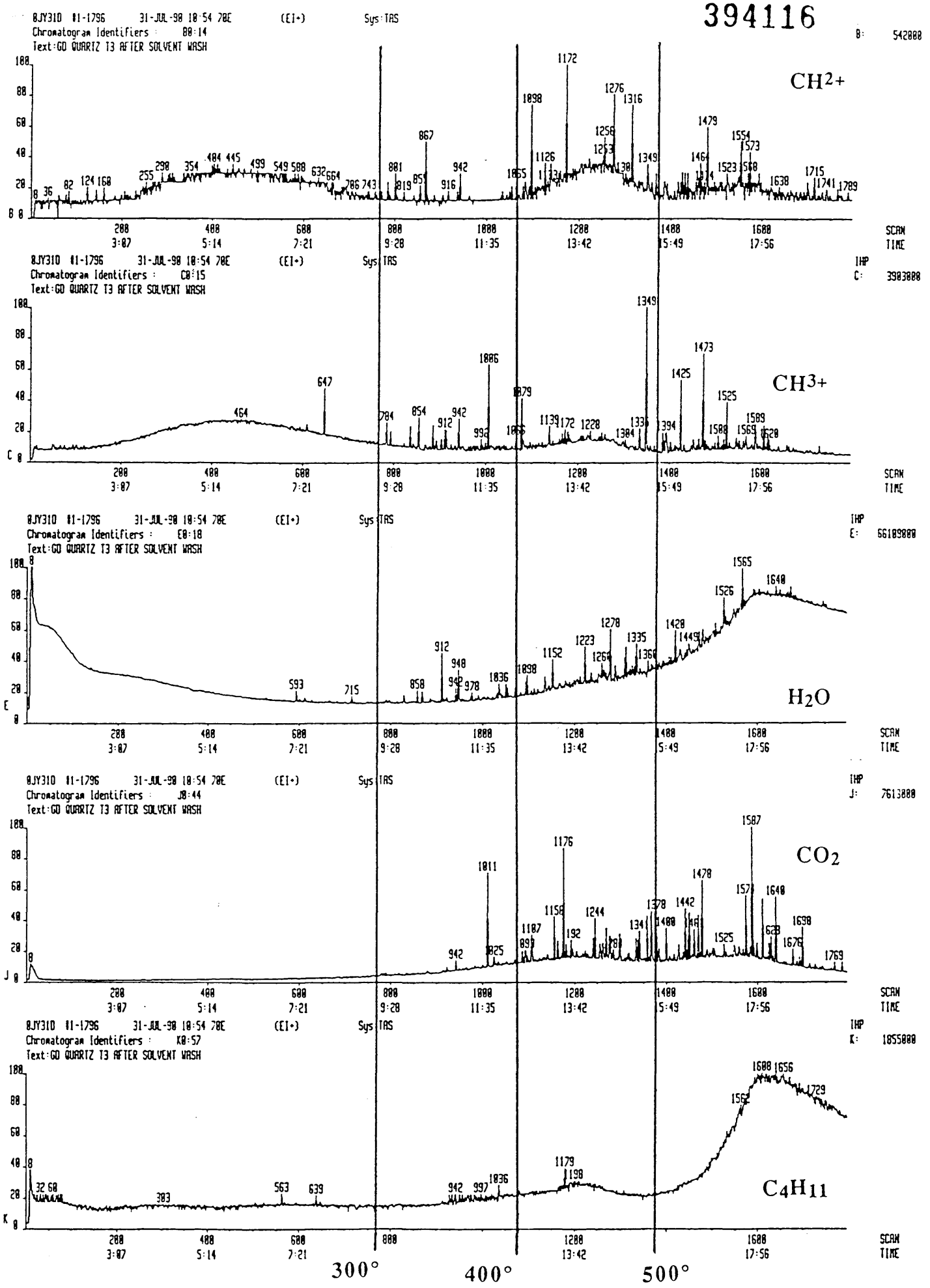


Figure 12 Fluid inclusion decrepitation profiles for quartz from the Trafalgar arsenopyrite-bearing quartz veins.

deformation was accentuated in areas which were already more strongly jointed by previous ductile deformation, resulting in greater permeability. Hot fluids expelled from the fractionating pluton deposited some gold in dilatant sites within the already-crystallised granite-rim, but mainly deposited gold and arsenic within the granite aureole. Hydrothermal brecciation signifies areas which experienced enhanced turbulent fluid flow, such as at New Carthage and Brilliant.

4.0 GEOPHYSICAL INVESTIGATIONS.....*M.Roach*

4.1 **Introduction**

A gravity survey was conducted in the Golden Ridge area to provide an estimate of the nature of the contact between the granitic rocks of the Blue Tier Batholith and the Siluro-Devonian Mathinna Beds sediments.

A total of 49 gravity measurements were obtained. Stations were located on three lines, two of which were oriented north-south across the granite contact, with the third aligned east-west to the south of the contact (Figure 13).

Forward modeling of the residual gravity data from lines 1 and 2 suggest contact angles of 45° and 65° respectively. Modeling also indicates the presence of a large volume of low density granitic material beneath the Mathinna Beds and implies a maximum thickness of sediments of approximately 3km.

4.2 **Data Acquisition and Reduction**

Field work was conducted during April 1990 using a Worden gravity meter (No. 592) from the Tasmanian Department of Resources and Energy

State gravity base station number 7551-9414 on the Fingal - Mathinna road was used to establish two new base stations, 9049-8000 at Golden Ridge and 9049-8117 at Evercreech. These base stations were then used for all subsequent work in the Golden Ridge area.

Base Stations

Station	Easting	Northing	Elev.	Obs. Gravity
9049-8000	585590mE	415760mN	566.0m	980188.27 mgal
9049-8117	581880mE	413080mN	305.2m	980247.32 mgal

Location of the majority of stations in the Golden ridge area was by means of compass and hip-chain traverses from clearly identified geographic features. Elevations were determined barometrically from available spot heights, using the methods of Leaman (1984), with maximum loop closure times of two hours.

A density of 2.67t/m^3 was used for the Bouguer reduction, which represents an average crustal density value and is standard for all gravity surveys carried out by the Tasmanian Department of Resources and Energy.

All stations were terrain-corrected to a radius of 21km following the method of Hamer (1939) using topographic maps at scales of 1:5000, 1:25 000 and 1:100 000. Terrain corrections range from 0.78 to 8.64mgal with the majority of stations in the range from 1 to 2mgal (Figure 14).

Terrain-corrected Bouguer anomalies are shown in Figure 15. The most significant source of error in these values arise from uncertainties in the determination of elevation, which is estimated as 1.5 - 2m in areas of low relief, rising to 3 - 4m in the regions of steepest topography. This corresponds to an error of between 0.2 and 0.5mgal in the Bouguer anomaly. For the majority of stations in this survey the error is estimated to be 0.3mgal.

The total Bouguer gravity field is the result of a combination of both regional and local factors. In order to correctly interpret the local field it is necessary to first remove the regional field from the measured data. The regional field used for this survey was Mantle88 (Leaman 1988), which is derived from a model of crustal thickness across the whole of Tasmania. The calculation of the residual Bouguer anomaly values shown in Figure 16 was carried out by the Tasmanian Department of Resources and Energy. All subsequent interpretation and modelling uses these residual values.

4.3 Physical Properties

As part of a wider study of rock physical properties in N.E. Tasmania, 12 samples were obtained from the vicinity of Golden Ridge. Eight of these samples were of Mathinna Beds sediments and four were from the Golden Ridge granitoid. All samples were taken from surface outcrop and as a result, were subject to variable degrees of weathering. Average values from Golden Ridge and adjacent areas are shown below.

Rock Unit	Density (t/m^3)	Mag.Susc. (x10^{-3} SI)
Mathinna Beds	2.50 - 2.72	0.05 - 0.25
Golden Ridge granitoid	2.70	0.15
Poimena Pluton Granite	2.61	0.03
Pyengana Granodiorite	2.75	5.00

Measured properties for the Mathinna beds vary considerably, while those for the granitic rocks remain fairly well constrained, despite the effects of weathering. Estimating

bulk physical properties values for the Mathinna Beds is enigmatic, with measured values generally less than those for the Golden Ridge granitoid whereas gravity measurements clearly show that the Mathinna Beds must on average be denser.

The problem of variability in Mathinna Beds physical properties has been recognised in previous studies, with Leaman (1975) estimating a bulk density of 2.75t/m^3 based on calculations from gravity readings taken underground at Rossarden and Storeys Creek mines. In the absence of better information this value has been adopted for all non-contact metamorphosed Mathinna Beds and a value of 2.77t/m^3 for sediments within the metamorphic aureole. This appears to be a reasonable estimate as the Mathinna Beds show little or no gravimetric contrast with the Pyengana Granodiorite (density 2.75t/m^3)

The Golden Ridge granitoid is significantly denser (2.70t/m^3) than the bulk of the Poimena pluton to the north (2.61t/m^3). The downward trend observed in the gravity data at the northern end of both lines 1 and 2 suggests that a contact between these two rocktypes may occur just to the north. To date no sampling has been done to test this prediction.

The Pyengana granodiorite, which outcrops approximately 4km to the northwest of Golden ridge, is distinguished both by its high density and by its considerably higher magnetic susceptibility. It is the only major rock unit in this part of N.E. Tasmania with a strong magnetic response and it is clearly delineated on the Tasmanian Department of Resources and Energy Mathinna – Alberton aeromagnetic survey.

A subsurface body with a similar composition to the Pyengana granodiorite is inferred from modelling a broad, low amplitude magnetic anomaly just to the west of Golden Ridge. Gravity line 3 was measured in order to investigate this anomaly.

4.4 Interpretation

The residual Bouguer anomaly values shown in Figure 16 are all highly negative, ranging from -10 to -21 mgal. From a purely qualitative point of view, this implies considerable volumes of material with a density less than the Bouguer reduction density of 2.67t/m^3, underlying the entire Golden Ridge area.

Quantitative numerical 2D forward modeling was conducted on the three survey lines using the method of Talwani, Worzel and Landisman (1959) as formulated by Grant and West (1965). Where applicable, sensitivity analysis was carried out in order to provide a measure of the confidence to be attached to the model results. Results for each line are discussed individually.

4.4.1 *Line 1*

Gravity line 1 runs north-south passing through the main saddle on Golden Ridge and approximately 200m to the west of Queen of the Earth workings. Residual Bouguer

anomalies along this line range from -21.2 in the north to -10.9mgal in the south. Values decrease rapidly at the northern end of the line and show a step response, crossing the contact between the Golden Ridge granitoid and the Mathinna Beds.

One measurement, station 8018, appears to be erratic. It was measured in an area of extreme topography and the most likely cause of the error lies in the determination of elevation, because there were no control points in the vicinity. Terrain corrections for this station have been repeated and checked independently. It is unfortunate that this reading occurs at such a significant location on the profile.

Models were calculated for contact angles between the Mathinna Beds and the granite ranging from 30° to 90° in 5° increments. All models were constructed with a regional extent of at least 20 km north and south of Golden Ridge, in order to avoid edge effects. Topography has also been incorporated into each model in the immediate vicinity of Golden Ridge.

For each contact angle, model geometry was adjusted to obtain the best possible fit between observed and calculated data. The RMS error for the best possible solution in each case was plotted against the contact angle to produce the sensitivity diagram shown in Figure 17. Station 8018 was omitted from the observed data file for the calculation of the RMS error.

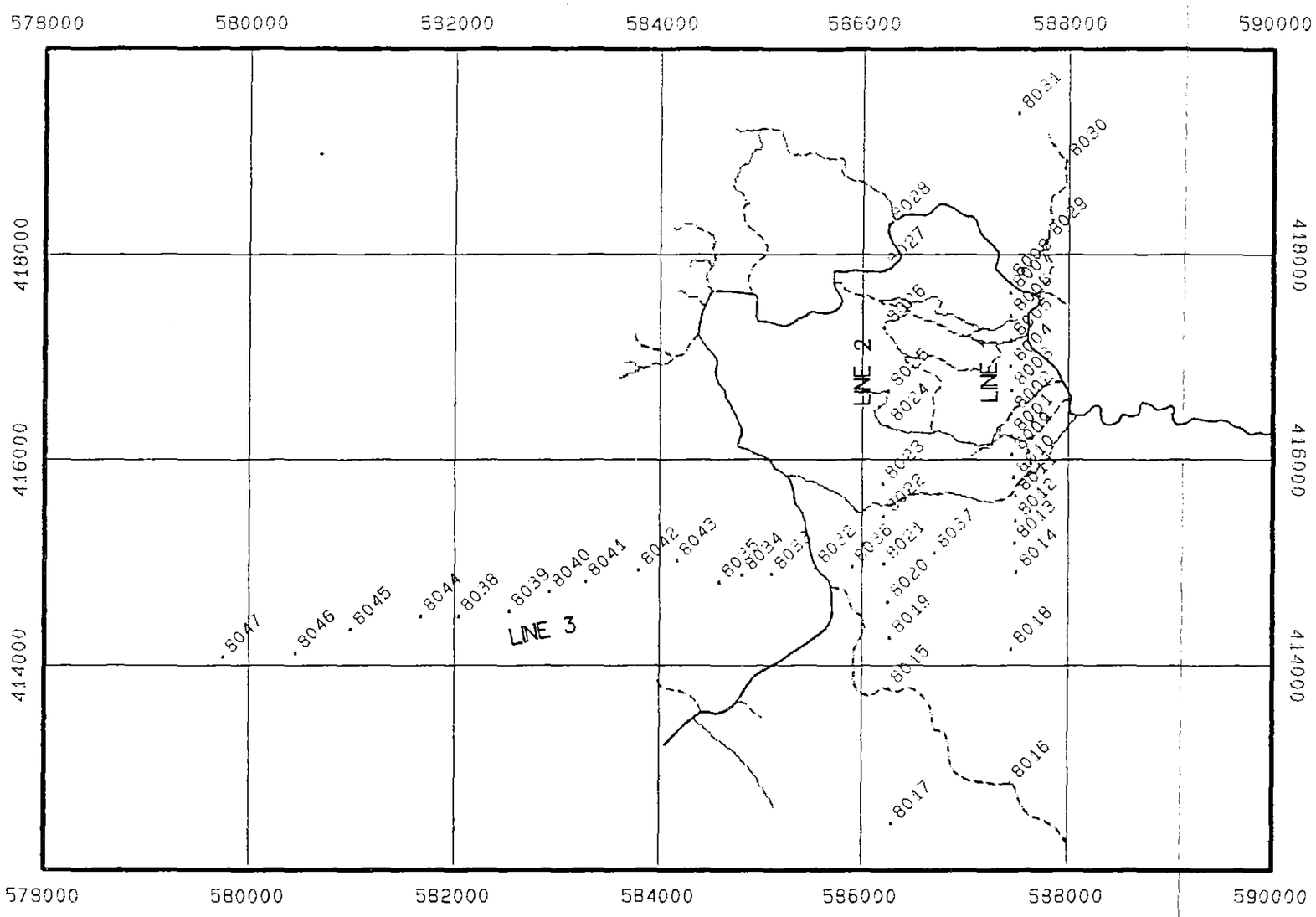
The minimum RMS error occurs for a model with a contact dip of 45°. The sensitivity diagram shows a rapid increase in RMS error as the contact dip increases beyond 45°, while only a gradual increase as the contact dip angle decreases. This implies an upper limit of approximately 50° but also indicates that there is little to distinguish between models with a contact dip of less than 50°.

The model for a 45° contact dip is shown in Figure 18. The most significant feature to note is that, in order to match the highly negative nature of the residual gravity field across the entire Golden Ridge area, it is necessary to model large quantities of low density granite in the subsurface. A thickness of nearly 9km of granite with a density of 2.61t/m^3 is required to produce the value of -21.2mgal observed at the northern end of line 1. This thickness is consistent with estimates made in previous studies of the gravity field in N.E.Tasmania (Leaman and Symonds 1975, Leaman 1977)

The magnitude of the step anomalies observed on line 1 impose some limits on the thickness of both the Mathinna Beds and the Golden Ridge granitoid. A maximum thickness of 1.7 to 2km for 2.70t/m^3 granite is estimated, whereas for 2.75t/m^3 Mathinna Beds a maximum thickness of 3km is indicated. The closest gravity stations, approximately 12km to the south of line 1, have residual values of -9mgal which implies only a gradual thickening of the Mathinna Beds to the south

There is a degree of ambiguity associated with the interpretation of line 1, due to the erratic nature of station 8018. It is possible, with an equal degree of numerical accuracy, to

394121



GOLDEN RIDGE AREA - GRAVITY SURVEY

STATION LOCATIONS

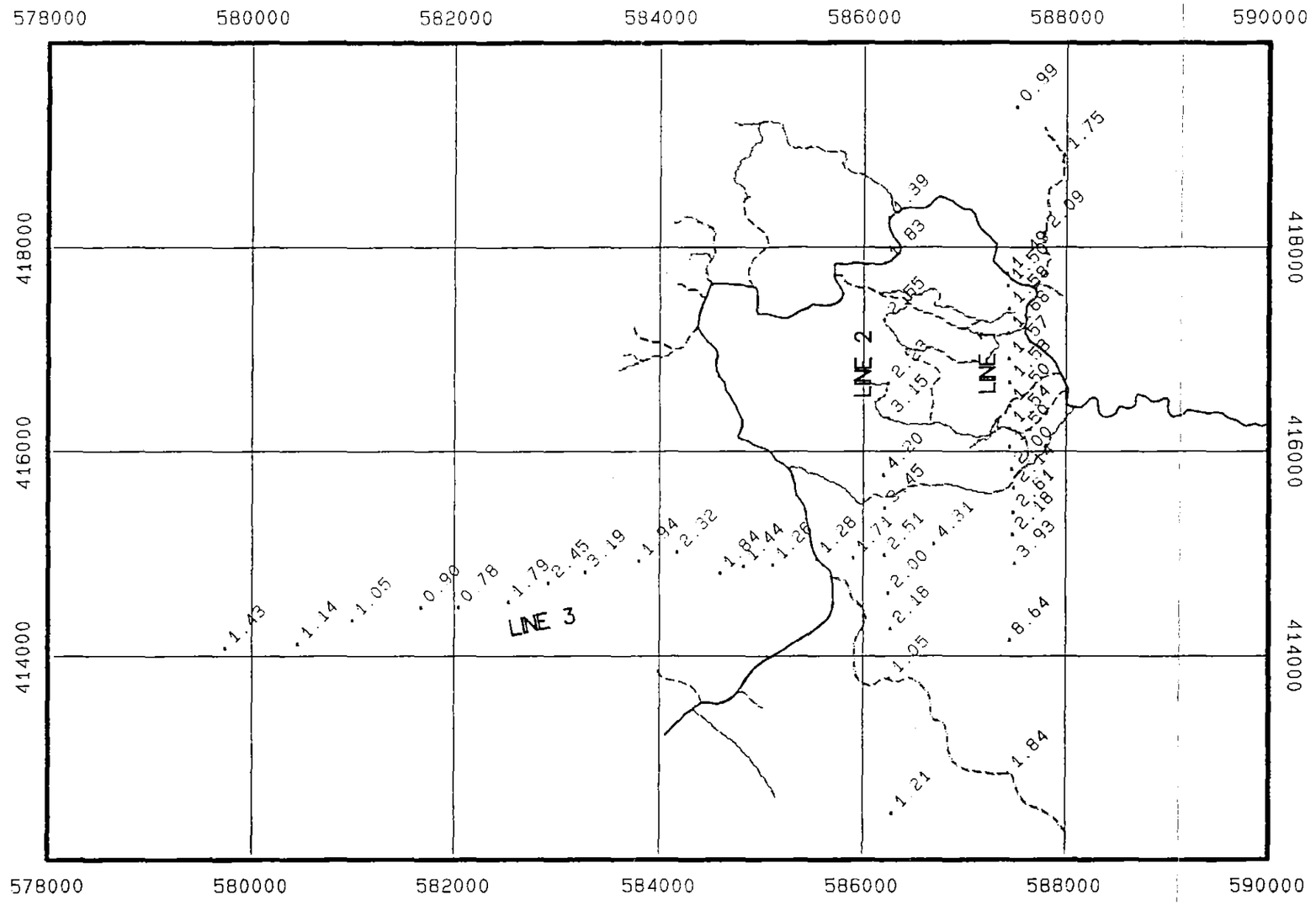
1:50,000 (5 cm)

91-3232

M.Roach - Centre For Ore Deposit And Exploration Studies - 20/10/90

Figure 13

334122



GOLDEN RIDGE AREA - GRAVITY SURVEY
TERRAIN CORRECTIONS
1:50,000

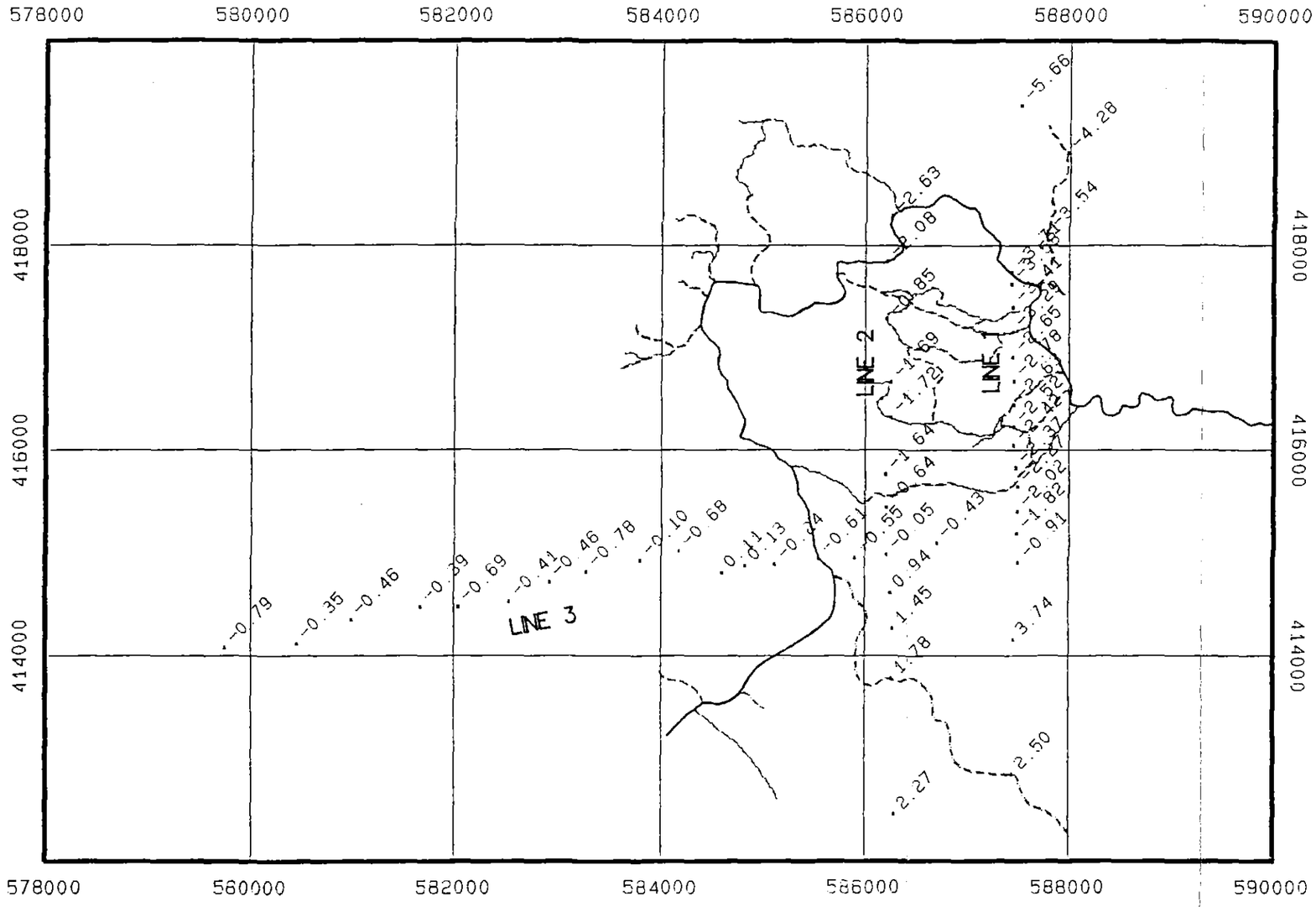
5 cm

91-3232.1

M.Roach - Centre For Ore Deposit And Exploration Studies - 20/10/90

Figure 14

394123



GOLDEN RIDGE AREA - GRAVITY SURVEY
TERRAIN CORRECTED BOUGUER ANOMALIES
1:50,000

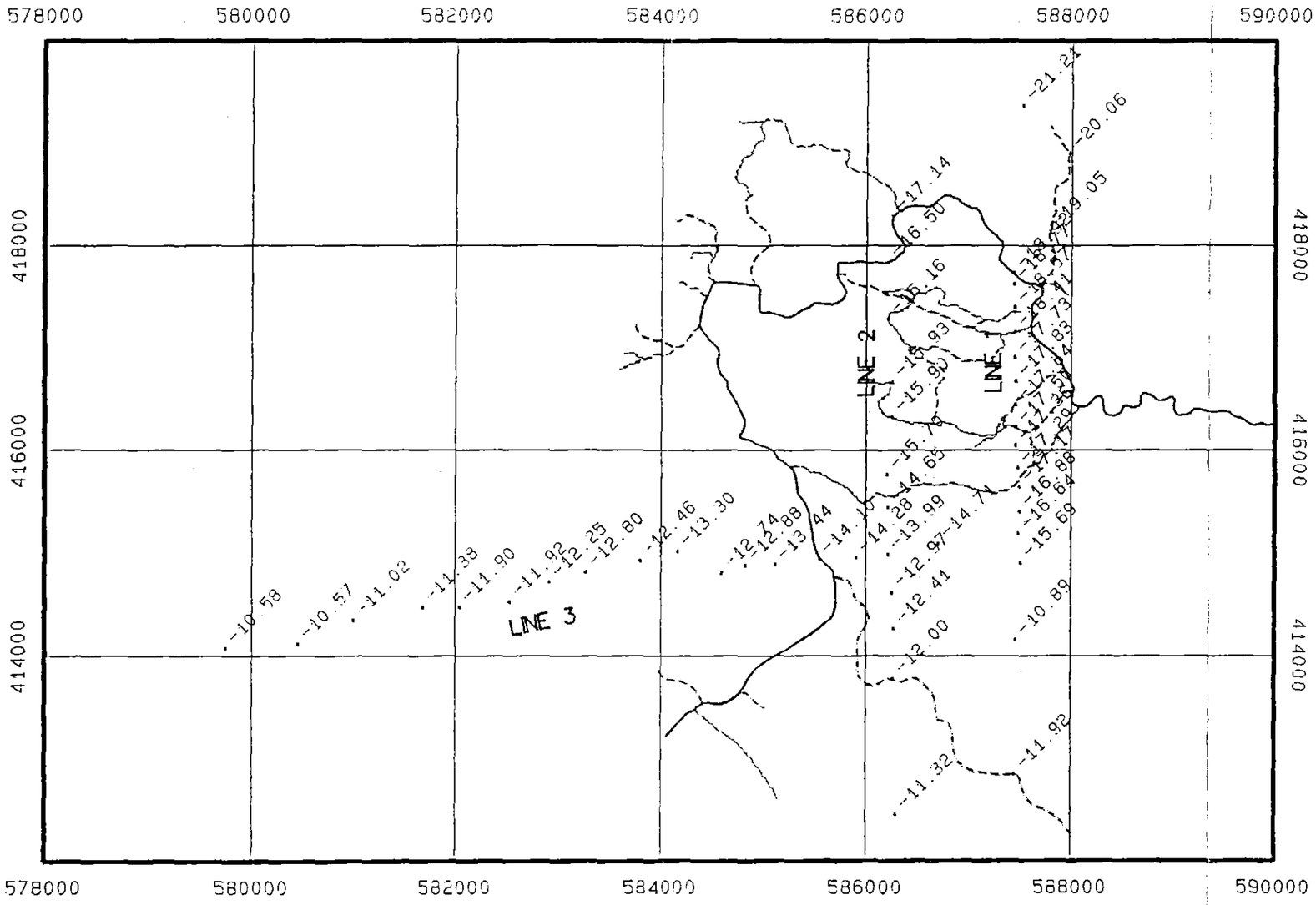
5 cm

M.Roach - Centre For Ore Deposit And Exploration Studies - 20/10/90

91-3232

Figure 15

394124



GOLDEN RIDGE AREA - GRAVITY SURVEY
RESIDUAL BOUGUER ANOMALIES
1:50,000

5 cm

M.Roach - Centre For Ore Deposit And Exploration Studies - 20/10/90

91-3232

Figure 16

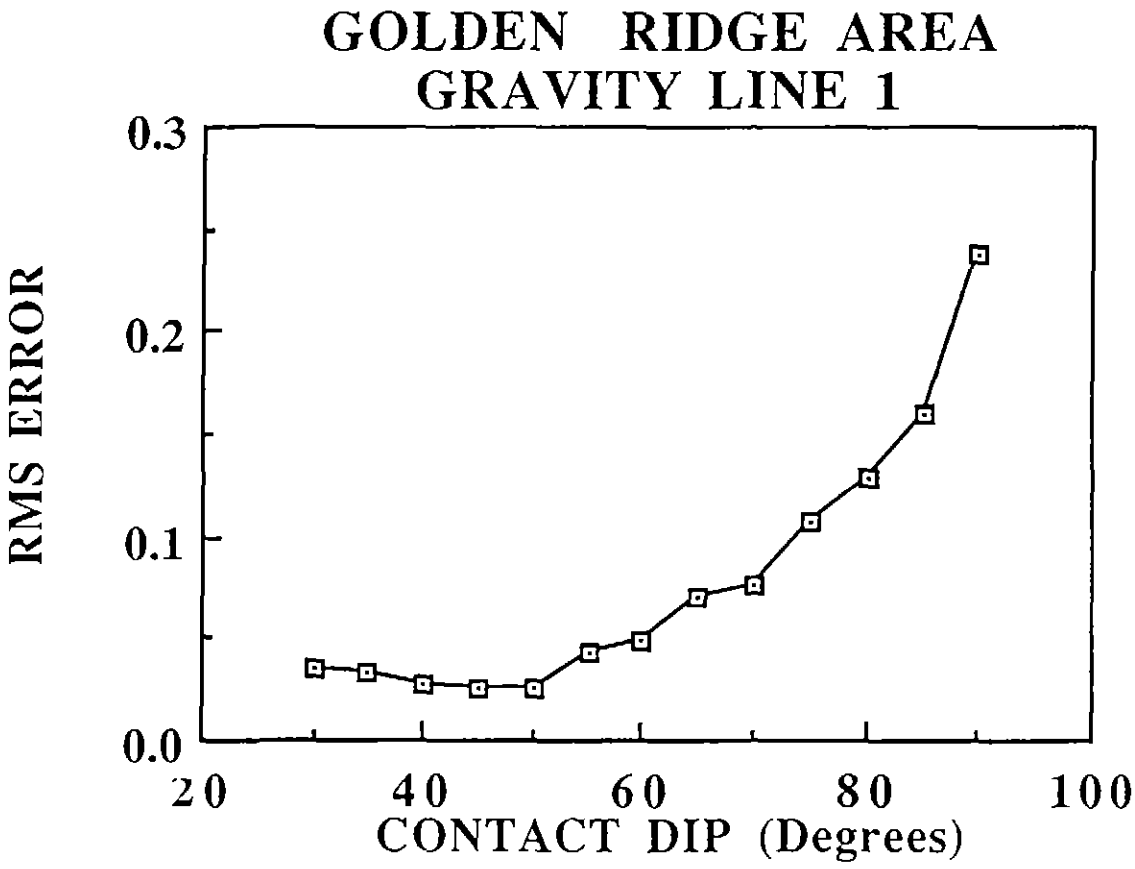


Figure 17 Gravity line 1 - Sensitivity Diagram.

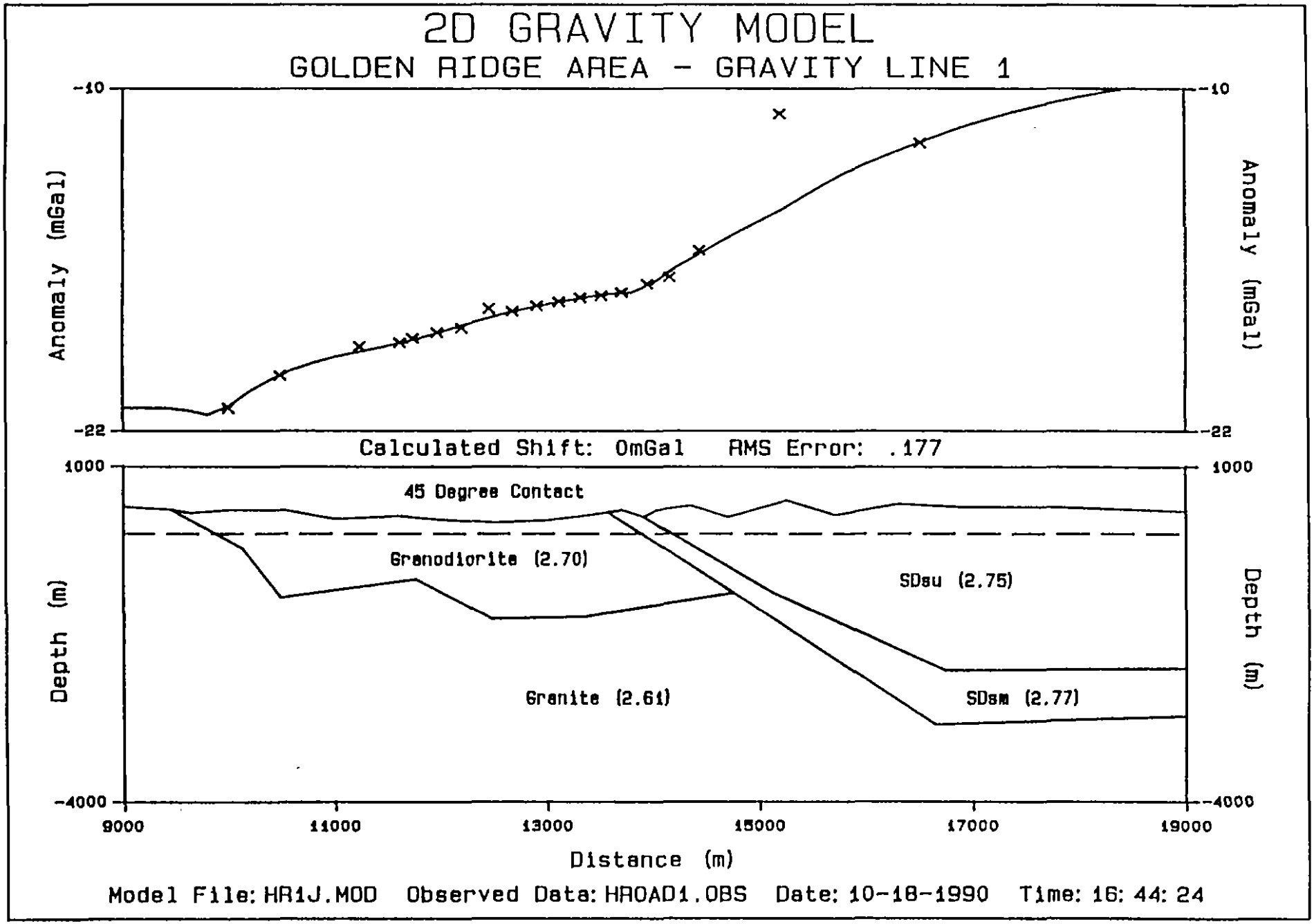


Figure 18

fit a model of the form shown in Figure 19 to the observed data. Distinguishing between a model of this form and a simple dipping contact will require remeasuring station 8018 and the acquisition of additional stations adjacent to it.

4.4.2 *Line 2*

Gravity line 2 trends north-south, passing over Golden Ridge approximately 400m to the east of Brilliant mine workings. Residual Bouguer anomalies range from -17.1 in the north to -11.3mgal in the south. The trend of decreasing values in the northern portion of line 1 is repeated on line 2, suggesting the presence of a contact between Golden Ridge granitoid and granite just to the north. A distinct step response is associated with the Mathinna beds contact.

Models were constructed, using the methods described for line 1 with contact angles between the adamellite and the Mathinna Beds ranging from 40° to 90° in increments of 5 degrees. The sensitivity diagram for line 2 is shown in Figure 20. The minimum in RMS error occurs for a contact dip of 65°. As with line 1, the RMS error rises rapidly as the contact angle is increased while reduction of the contact dip results in a lower rate of increase in RMS error.

The model for a contact dip of 65° is shown in Figure 21. A simple planar dipping contact appears to fit the observed data well. The maximum inferred thickness of Golden Ridge granitoid in this model is 2.1 km. The modelled thickness of the Mathinna Beds to the south of Golden Ridge is 3km.

4.4.3 *Line 3*

Line 3 is oriented roughly east - west and passes to the south of the Golden Ridge granitoid contact. Residual Bouguer anomaly values decrease steadily from -10.58mgal in the west to -16.64mgal in the east.

The purpose of this line was to investigate a broad positive magnetic anomaly, presumed to result from a subsurface body of granodiorite with similar composition to the Pyengana Granodiorite. No gravimetric anomaly is apparent due to the fact that the Mathinna Beds and the inferred Granodiorite have approximately the same density ($2.75t/m^3$). The observed gradient in the gravity data simply provides an indication of the subsurface low density granite, dipping slowly to the west. Beneath the area of the magnetic anomaly, the implied depth to the top of the granite is 2.3 to 2.8km.

Figure 22 shows the data for line 3 together with a rough interpretation. It is impossible, using gravity data alone to resolve the detail of the subsurface granodiorite. As yet no detailed magnetic modeling has been carried out however regional interpretation (Figure 23) suggests a minimum depth to the top of the body of less than 1km. This result should now be refined using the available information from gravity line 3.

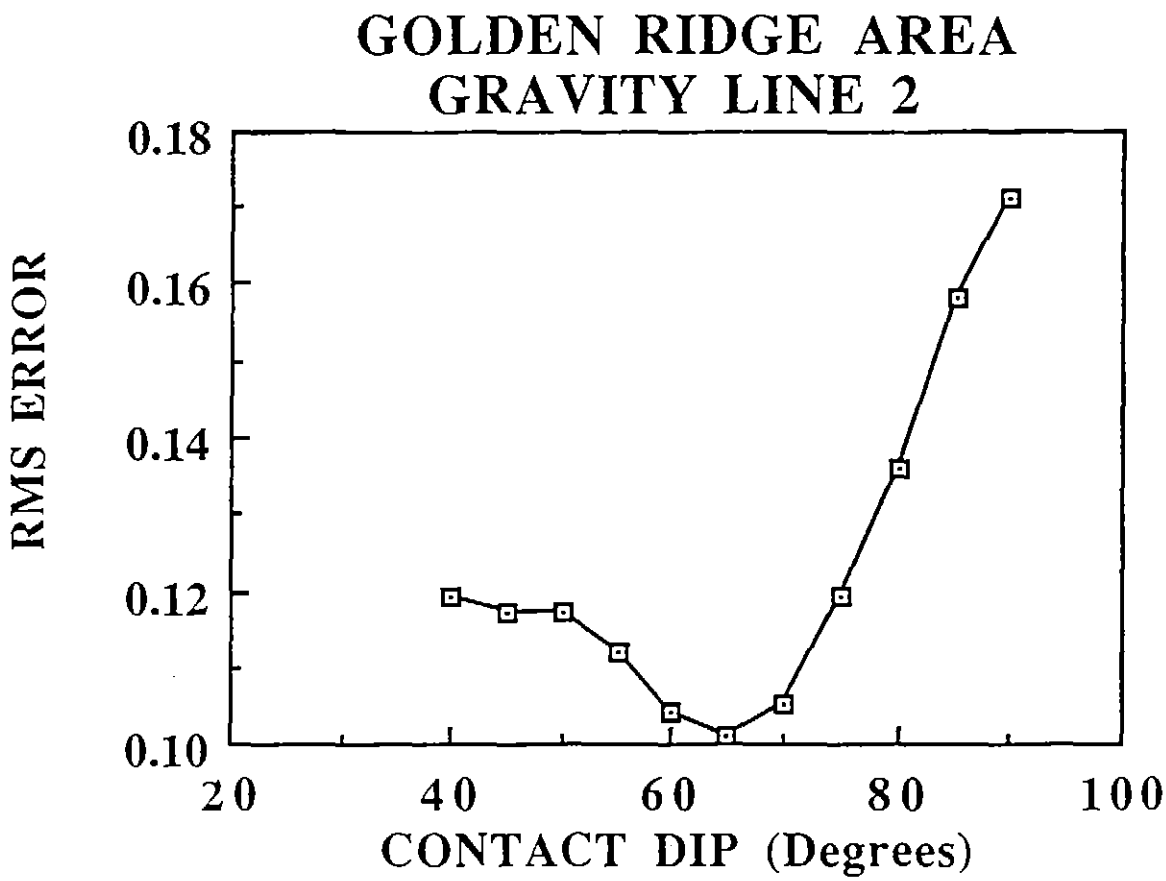


Figure 20 Gravity line 2 - Sensitivity Diagram.

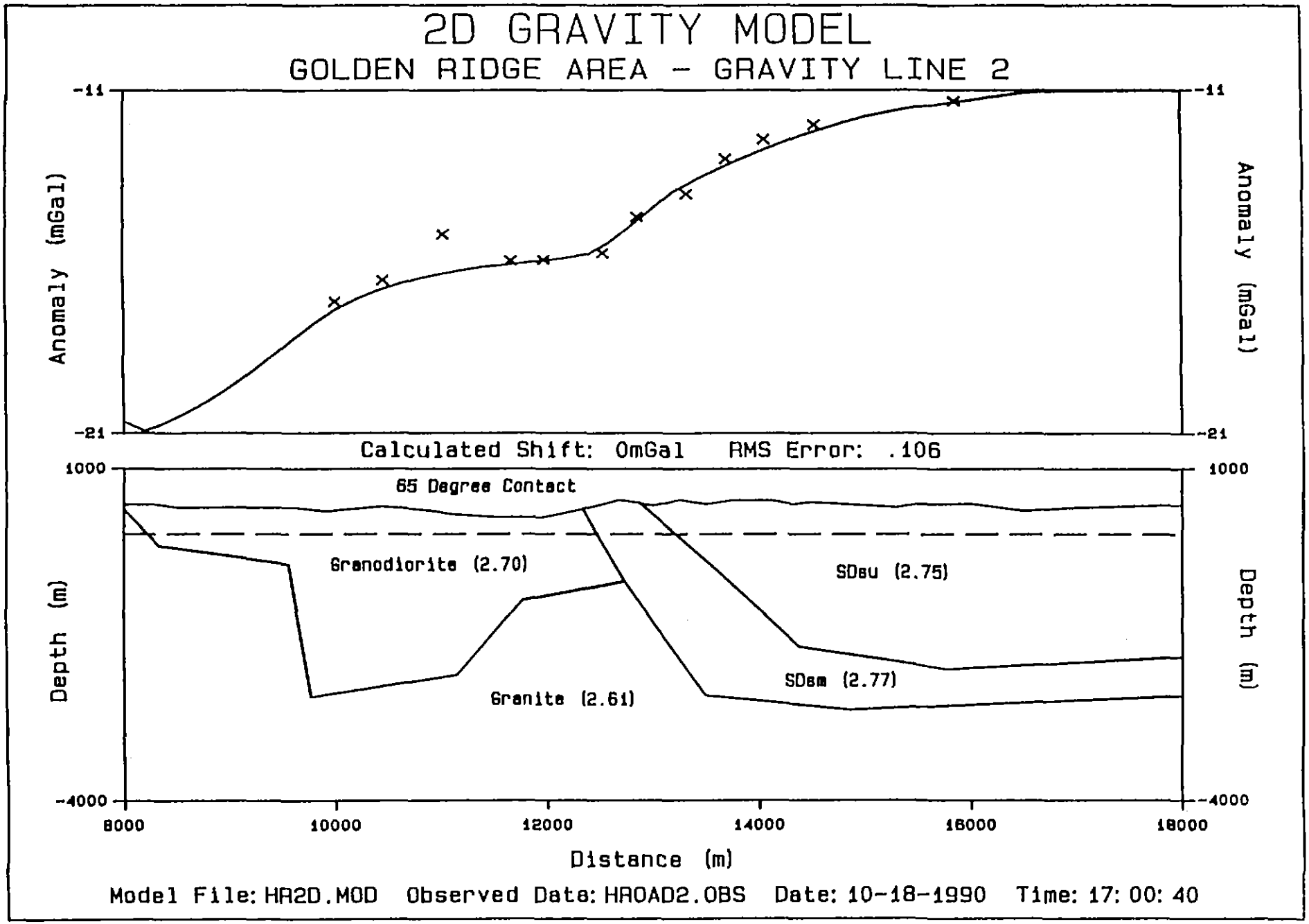


Figure 21

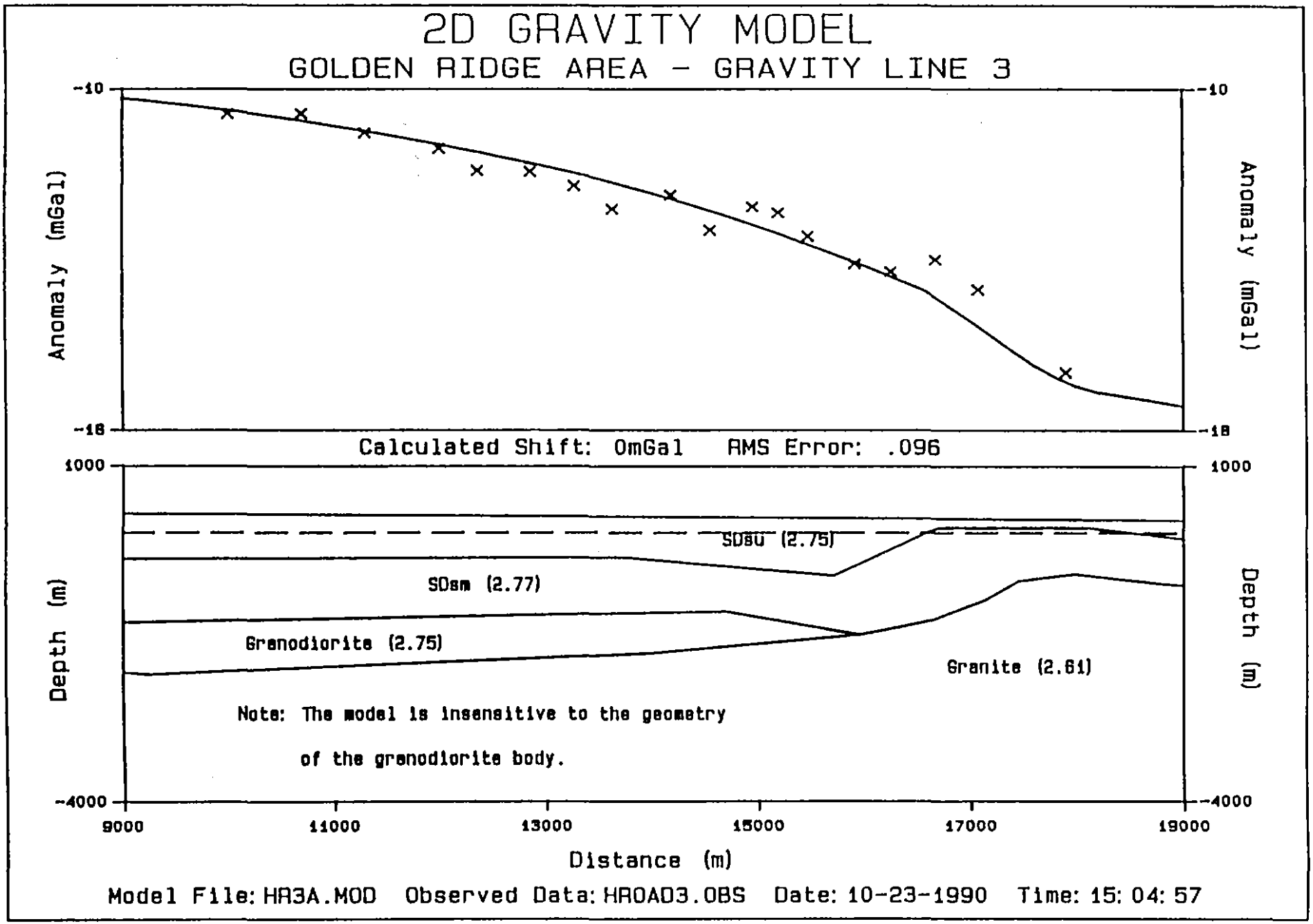


Figure 22

394130

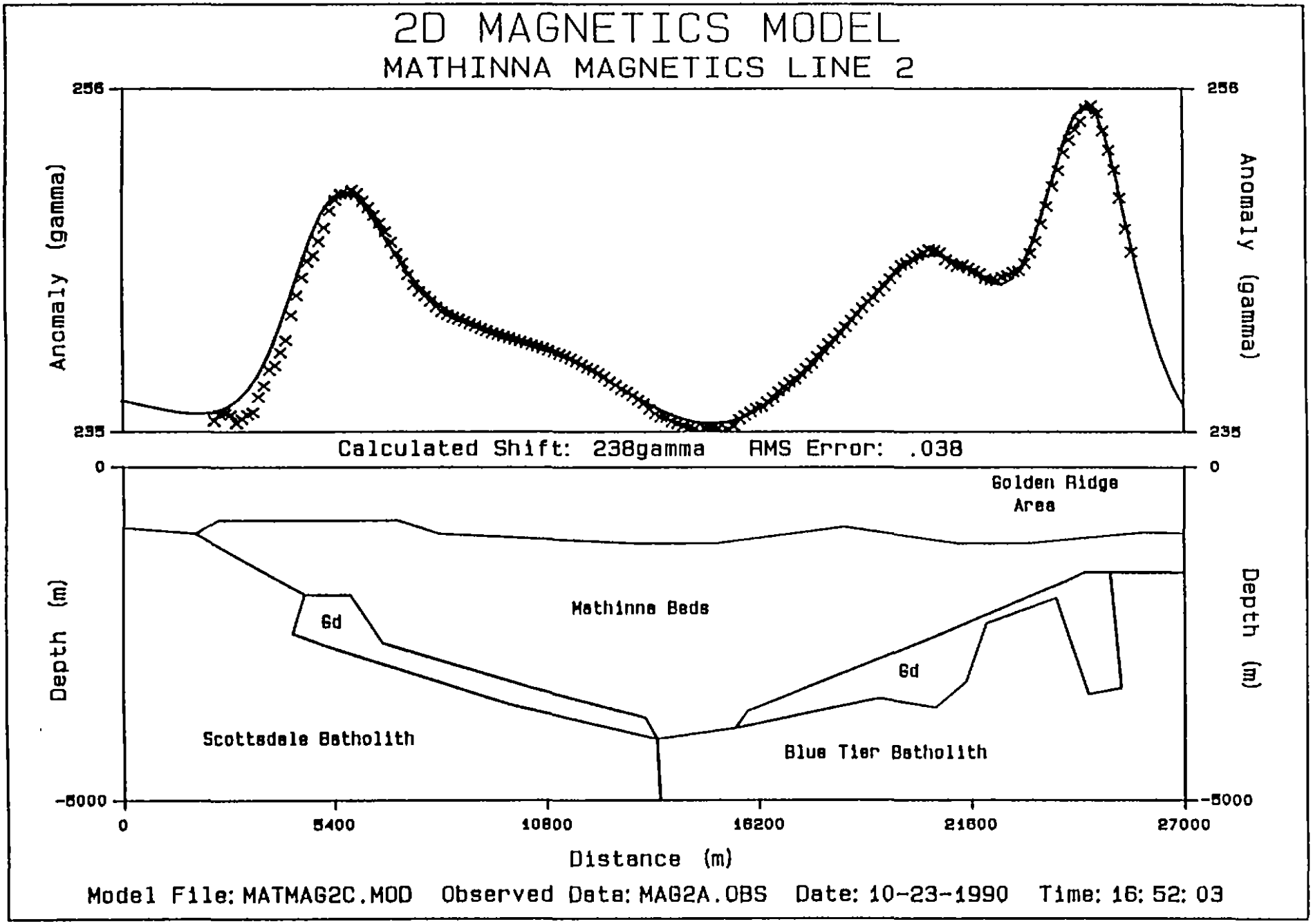


Figure 23

4.4.4 *Thickness Of Mathinna Beds*

The model results from gravity lines 1 and 2 have been used to generate structural contours on the base of the Mathinna Beds (Figure 24). From the structural contours the thickness of the Mathinna Beds was calculated using digital topographic data (Figure 25).

The thickness of Mathinna Beds sediments beneath the Brilliant workings is estimated as 1200 - 1300m while beneath Queen of the Earth the thickness is likely to be only 600m.

4.4.5 *Extent Of The Golden Ridge Granodiorite*

The Golden Ridge granitoid is both geophysically and geochemically distinct from the Poimena and Pyengana bodies to the north and northwest. It is also the only intrusion in this area which appears to have closely associated gold mineralisation. For this reason it is important to delineate its likely extent.

Previous regional mapping places a boundary between the Pyengana and Poimena plutons just to the west of Golden Ridge. However, the recent aeromagnetic survey covering this area that the boundary between the strongly magnetic Pyengana and the weakly magnetic Golden Ridge body lies a further 3.5km to the west at the head of Evercreech Rivulet (Figure 26). This interpretation considerably increases the length of the prospective contact between the Mathinna Beds and the Golden Ridge Granodiorite.

The northern boundary, between the Golden Ridge and Poimena bodies, shown in Figure 26, is simply inferred from the outcrop geometry of the plutons and the slight change in magnetic character. No mapping or sampling has yet been undertaken to accurately delineate this contact.

The other notable feature shown in Figure 26 is the broad positive magnetic anomaly, located just to the west of Golden Ridge. It occurs in an area of unmetamorphosed Mathinna Beds and, as discussed in section 4.4.3, it is interpreted as a subsurface body of granodiorite with a composition similar to the Pyengana Granodiorite. Speculative boundaries for the body are shown. No relationship between this body and the gold mineralisation is at this stage inferred.

4.5 Conclusions and Recommendations: Geophysics

(a) The Golden Ridge granitoid is geophysically distinct from both the Poimena and Pyengana plutons.

(b) Modeling of gravity data suggests that the entire Golden Ridge area and the region to the south, is underlain by large volumes of low density granitic material. The maximum thickness of Mathinna Beds is calculated to be 3km, whereas the Golden Ridge granitoid appears to have a thickness of less than 2.5km.

(c) The contact angle between the granitoid and the Mathinna Beds ranges from 65° on line 2, to 45° on line 1. Interpretation of the data from line 1 is somewhat ambiguous due to an erratic station. It is suggested that this station be remeasured and that some additional stations be obtained in its vicinity.

(d) Interpretation of aeromagnetic data suggests that the contact between the Golden Ridge and Pyengana intrusions is approximately 3.5km further west than previously mapped. This suggestion nearly doubles the length of Mathinna Beds contact prospective for gold mineralisation.

(e) Aeromagnetic data indicate the presence of a subsurface granodiorite body beneath the Mathinna Beds just to the west of Golden Ridge. No relationship between this body and the gold mineralisation has yet been inferred.

5.0 APPLICATIONS TO EXPLORATION.....*M.Roach & Garry Davidson*

The outcrop pattern along the Golden Ridge spur has controlled our understanding of mineralisation around the Golden Ridge pluton, by providing a thin line of information from a point approximately 1 km above the granite above Brilliant, eastwards to exposures of the granite contact itself at Trafalgar. We see mineralisation across this entire spectrum, and hence ore location does not relate to depth above the granite surface, although different ore styles are probably depth-controlled. Another factor to consider in ore localisation is the role of host-rock composition. The Mathinna Beds within the aureole are apparently extremently uniform; nevertheless, subtle differences between sediment facies yet to be appreciated may turn out to be significant in the search for ore. At present however, the two dominant factors localising ore are (a) medium-scale structural features such as parasitic folds and faults, and (b) granite apophyses, such as that in the Trafalgar area.

Specific suggestions for further exploration are:

(1) The mode of outcrop expression has to date precluded exploration of the granite contact and the overlying 200 m of sediment on the northern side of the Golden Ridge spur. This area is prospective for Trafalgar – New Carthage ore-types, but is covered by extensive scree wedges which will require bedrock sampling techniques, rather than the superficial soil and stream sampling employed to date.

(2) The mineralisation at Trafalgar – New Carthage, which is concentrated on the most prominent apophyse in the area, probably extends to the north and east, although these areas have received little attention to date.

(3) Exploration should extend to cover the newly-defined geophysical limits of the Golden Ridge pluton.

(4) Areas of hydrothermal brecciation are obvious targets for further work. The largest area of such material, albeit only subcropping, extends southward up the New Carthage ridge, well beyond the known workings. More isolated zones have been mapped at

585300E, 415200N: west of Hogans Rd;

587000E, 415600N: east of Golden Ridge on the spur;

587850E, 415950N: 500 m west of Trafalgar.

This material contains good gold grades at New Carthage and Brilliant, but to my knowledge has not been analysed elsewhere.

(5)Local fold zones west of Blinding at:

585000E, 416080N: west of Blinding;

587900E, 415850N: west of Trafalgar;

586400E, 415950N: north of Golden Ridge.

(6) Regionally, greater dilation may have characterised wall-rocks west of the mapped area, by analysis of the mapped plastic deformation. Secondly, the area of brittle deformation which must surround the ductile aureole of granite intrusion is to date unexplored, but contains some gold mineralisation (e.g.,The Unknown Mine).

(7) Intra-granite targets?

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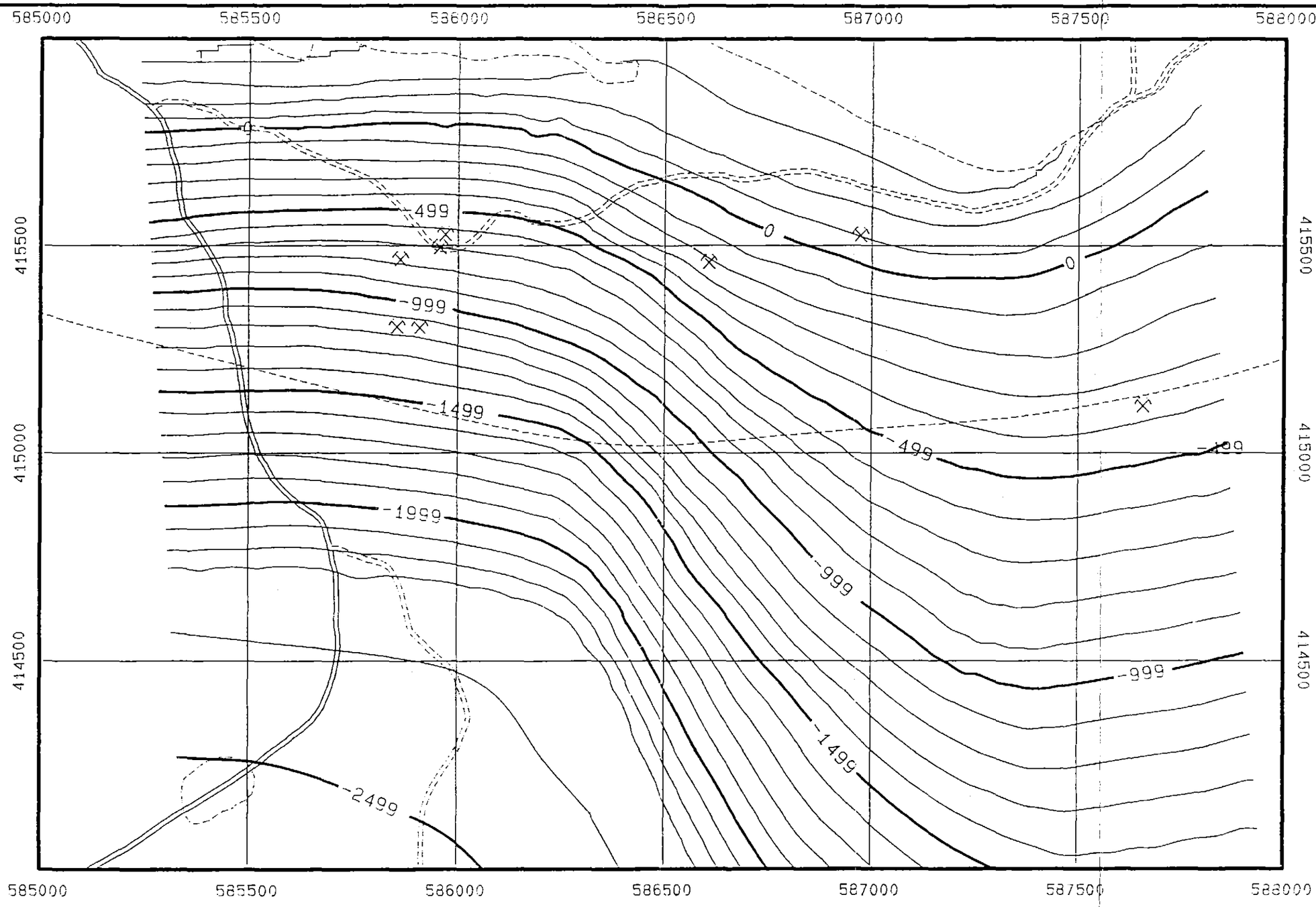


GOLDEN RIDGE AREA - GRAVITY SURVEY

STRUCTURE CONTOURS ON THE BASE OF THE MATHINNA BEDS

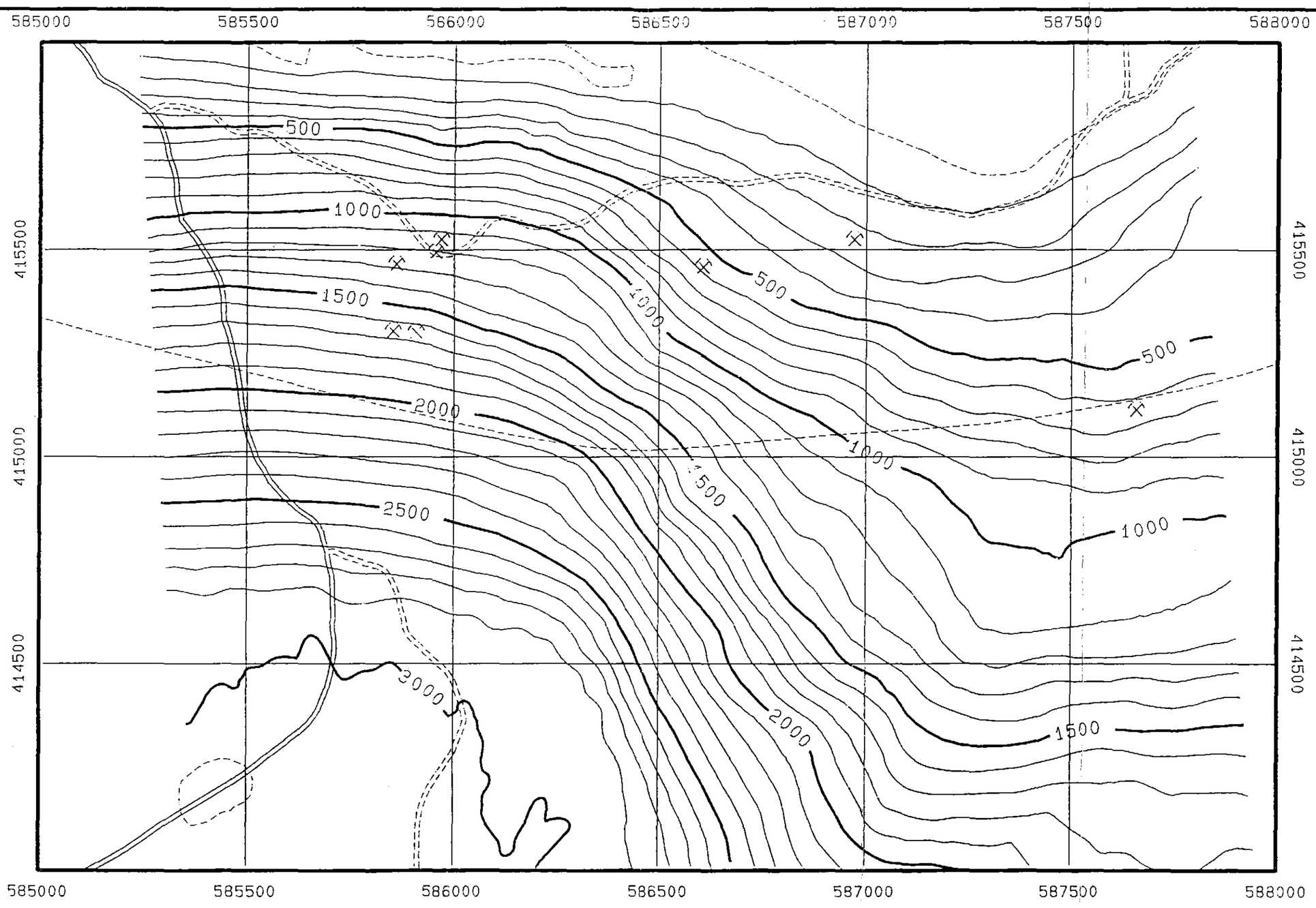
1:10,000

5 cm

M.Roach - Centre For Ore Deposit And Exploration Studies - 20/10/90

Figure 24

394137



GOLDEN RIDGE AREA - GRAVITY SURVEY

CALCULATED THICKNESS OF THE MATHINNA BEDS

1:10,000 5 cm

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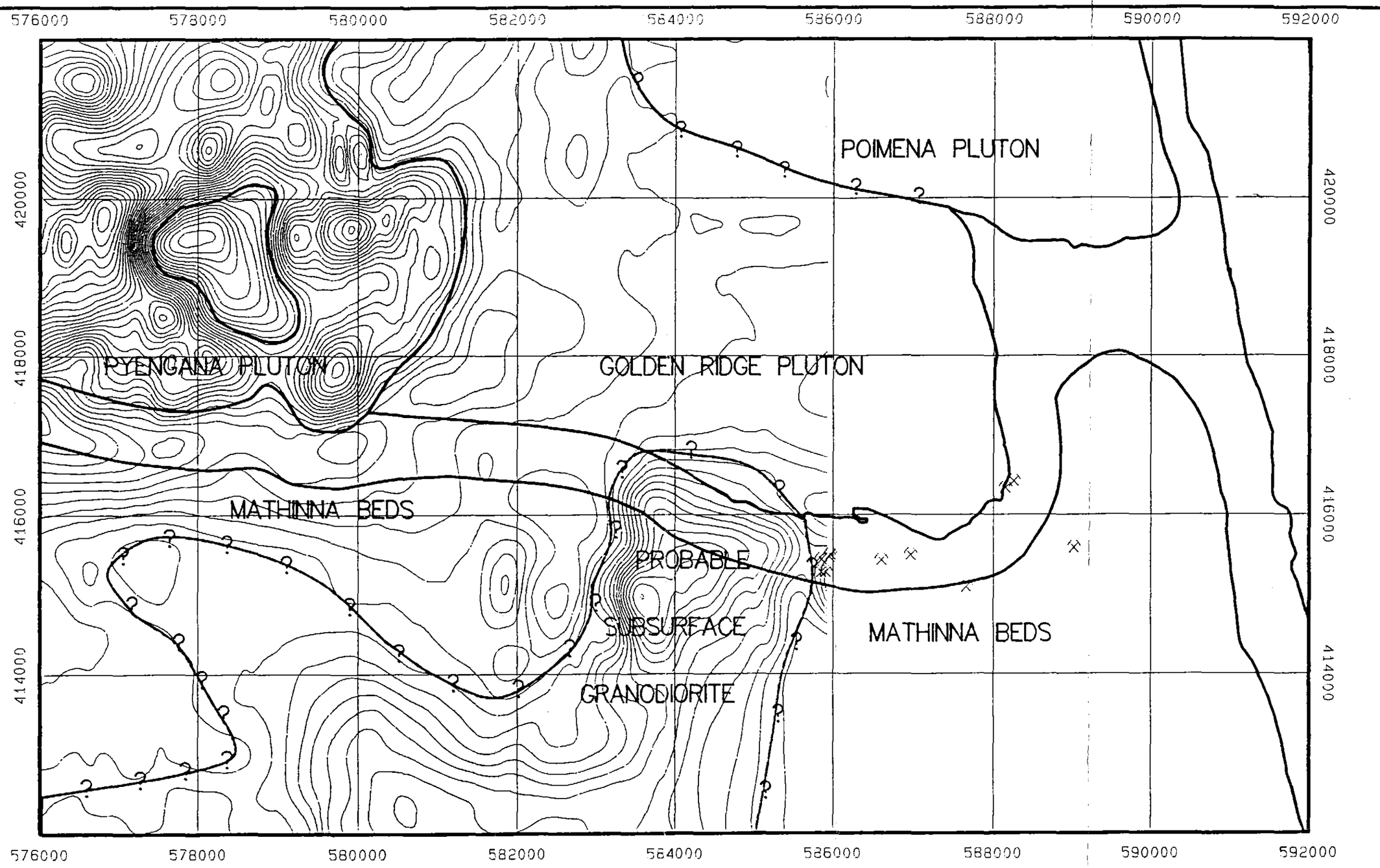
91-3232.

Figure 25



GOLDEN RIDGE AREA - GENERALISED GEOLOGY AND MAGNETICS - 1:50,000

Magnetics from Tas. Dept. of Mines Mathinna Alberton Survey. Contour Interval 5n

Figure 26

5417000N

5416000N

5415000N

Trafalgar Flat

RIDGE

Brilliant Creek

586000E

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	GOLDEN RIDGE EL 58/88		
Title	TOPOGRAPHIC BASE PLAN BRILLIANT CREEK GOLDFIELD		
Author	Dept	Scale	
Drawn	Date	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG. 4		Drawing No.	

9912

LEGEND

- Road/track
- Creek
- 18100 Sample number
- 0·05 BLEG Assay (ppb)
- Dg Devonian Granite
- PJ Permean Jurassic Cover

Geochemical Statistics

background < 1ppb Au
mildly anomalous > 1·4 ppb Au
strongly anomalous > 2·5ppb Au

91-3232.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	E.L. 58/88 GOLDEN RIDGE JV		
Title	BLEG STREAM SEDIMENT SURVEY SAMPLE LOCATION AND ASSAY RESULTS		
Author	Dept.	Scale	1:25000
Drawn ON	Date 5/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 5		Drawing No.	D/LJ 30/007

570000 E

580000 E

590000 E

600000 E

5430000 N

5420000N

5410000 N

TASMAN HIGHWAY

ST HELENS

EL 58/88

Sm

P

Dg1

MT VICTORIA

Dg2

Risky Ridge

Dg3

PYENGANA PLUTON

POIMENA PLUTON

Evercreech Rivulet

Back Gully Creek

Golden Ridge -Trafalgar

Brilliant

Golden Ridge

Trafalgar

Double Event

Ryans Creek

Bridge Creek

Queen of the Earth

Queen of the Earth Creek

Horrible Hollow Gully

J

EVERCREECH ROAD

HOGANS ROAD

MATHINNA ROAD

MATHINNA

5 cm

J Jurassic Dolerite

P Permian Sandstone, Shale

Sm Siluro Devonian Mathinna Beds

Upper Devonian Granitoids

Dg1 Biotite Hornblende Granodiorite

Dg2 Biotite Granodiorite

Dg3 Biotite Granite

BLEG Anomaly

3941403

Billiton Australia

The Metals Division of the Shell Company of Australia Limited

Project: GOLDEN RIDGE JV

Title:

E.L. 58/88

REGIONAL SETTING

AND LOCATION OF BLEG ANOMALIES

Author JPR	Date 3/90	Scale 1:100,000	
Drawn OH	Office TAS	Revised	Date
Drawing No.			Fig. No. 6

0914

5417000 N

5416000 N

5415000 N

586000 E

587000 E

588000 E

400

300

250

200

350

450

500

COSTEAN 5

COSTEAN 1

COSTEAN 3

COSTEAN 2, 2A

COSTEAN 4

COSTEAN 10

COSTEAN 6

COSTEAN 7

COSTEAN 9

COSTEAN 8, 8A

18230

18240

18250

18260

18270

18280

18290

18300

18310

BRILLIANT

CREEK

Brilliant
'prepost'
- Twelvetrees 1990

5 cm

LEGEND

Old Mineral lease boundaries

Mining lease boundary (current)

Road / track

Creek

Working

18220 BLEG Soil sample

91-3232.

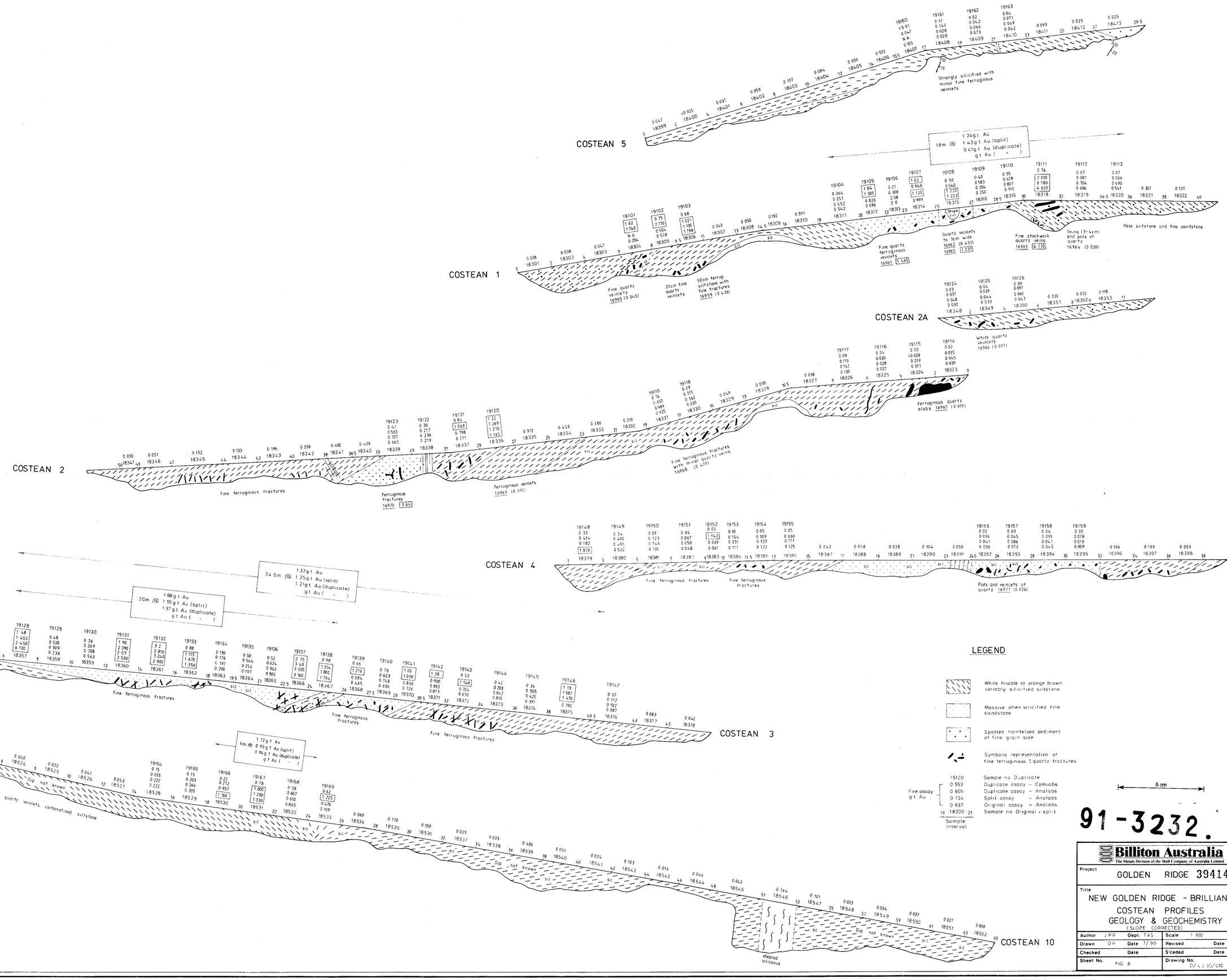
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: E.L. 58/88
GOLDEN RIDGE JV 394141

Title:
BRILLIANT CREEK GOLDFIELD
LOCATION OF COSTEANS
AND BLEG SOIL SAMPLES

Author JPR	Dept. TAS	Scale	
Drawn OH	Date 5/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 7		Drawing No. D/LJ 30/005	

9915



LEGEND

- White friable to orange brown variably silicified siltstone
- Massive often silicified fine sandstone
- Spotted hornfelsed sediment of fine grain size
- Symbolic representation of fine ferruginous ‡ quartz fractures

Fire assay g·t Au

19120	Sample no Duplicate
0·553	Duplicate assay – Comlabs
0·605	Duplicate assay – Analabs
0·734	Split assay – Analabs
0·697	Original assay – Analabs
19 18300 21	Sample no Original ± split
Sample interval	

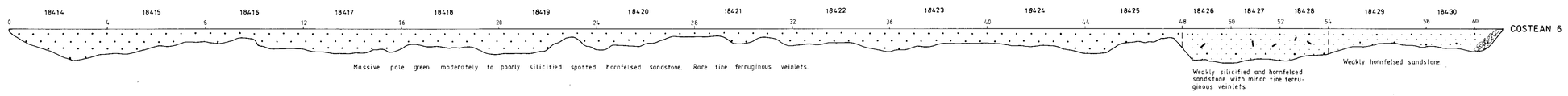
5 cm

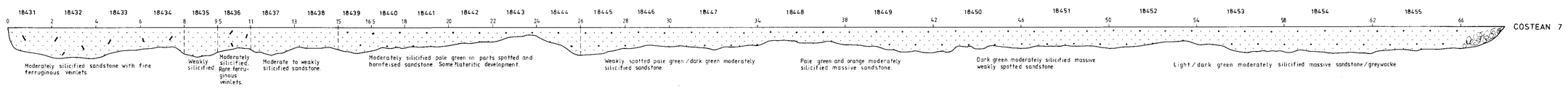
91-3232.

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	GOLDEN RIDGE 394142		
Title	NEW GOLDEN RIDGE - BRILLIANT COSTEAN PROFILES GEOLOGY & GEOCHEMISTRY (SLOPE CORRECTED)		
Author	J.P.R	Dept. TAS	Scale 1:100
Drawn	O.H	Date 7/90	Revised Date
Checked		Date	S'ceded Date
Sheet No.	FIG 8		Drawing No. D/L.J 30/610

9916





LEGEND

- Sandstone - variably silicified, sometimes micaceous, usually massive, fine grained
- MATHINNA BEDS – Siltstone - often silicified non laminated, may be cherty
- Hornfels - variably spotted sandstone or siltstone sometimes silicified.
- Mineralization - fine ferruginous quartz anastomosing veinlets & minor sugary quartz pods, stringers and veinlets.
- 10 18536 12 Sample interval (m) and Number.

N.B 1. Costeans drawn facing north.

2. See plan D/LJ30/00 for location of costeans.

5cm

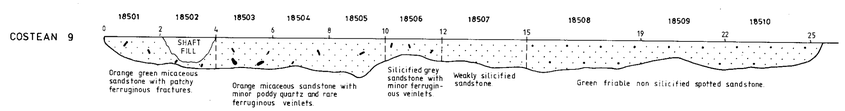
91-3232.

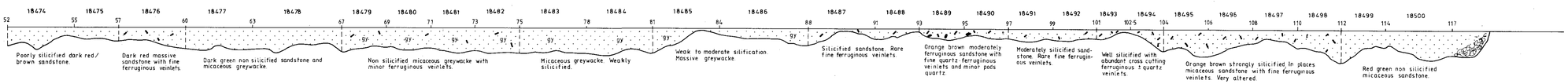
0 1 2 3 4 5 Metres
SCALE

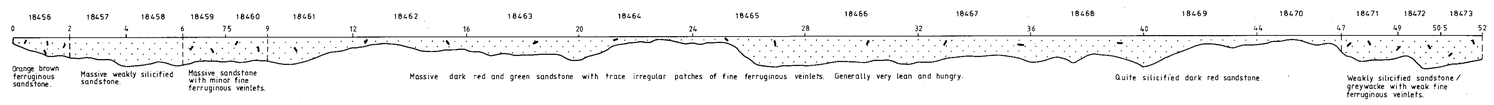
394143

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

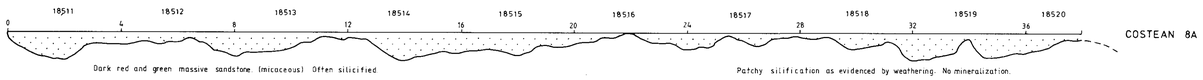
Project	E.L. 58/88 GOLDEN RIDGE J.V.		
Title	RIDGE TOP COSTEANING PROGRAMME MAY 1990		
Author J.P.R	Dept. TAS	Scale 1:100	
Drawn OH	Date 5/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 9		Drawing No. D/L J 30/005	







COSTEAN 8



COSTEAN 8A

LEGEND

MATHINNA BEDS

- Sandstone - variably silicified, sometimes micaceous, usually massive, fine grained.
- Siltstone - often silicified non laminated, may be cherty
- Hornfels - variably spotted sandstone or siltstone, sometimes silicified
- Mineralization - fine ferruginous & quartz anastomosing veinlets and minor sugary quartz pods, stringers and veinlets
- 10 18536 12 — Sample interval (m) and Number.

91-3232.

5 cm

N.B. 1. Costeans 8 and 9 shown in relationship to each other.

2. See plan D/LJ30/003 for location of costeans.

0 1 2 3 4 5 Metres
SCALE

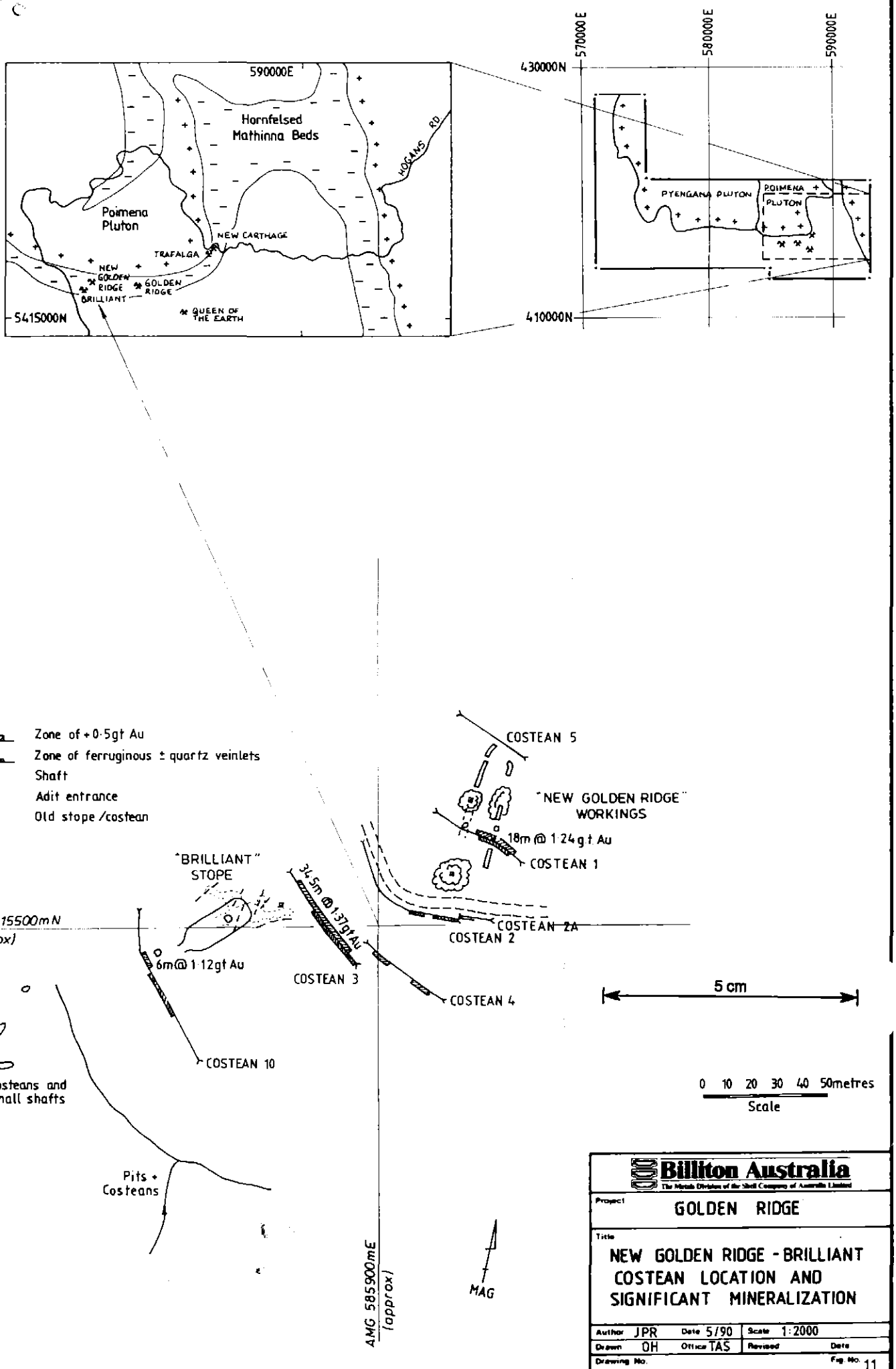
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

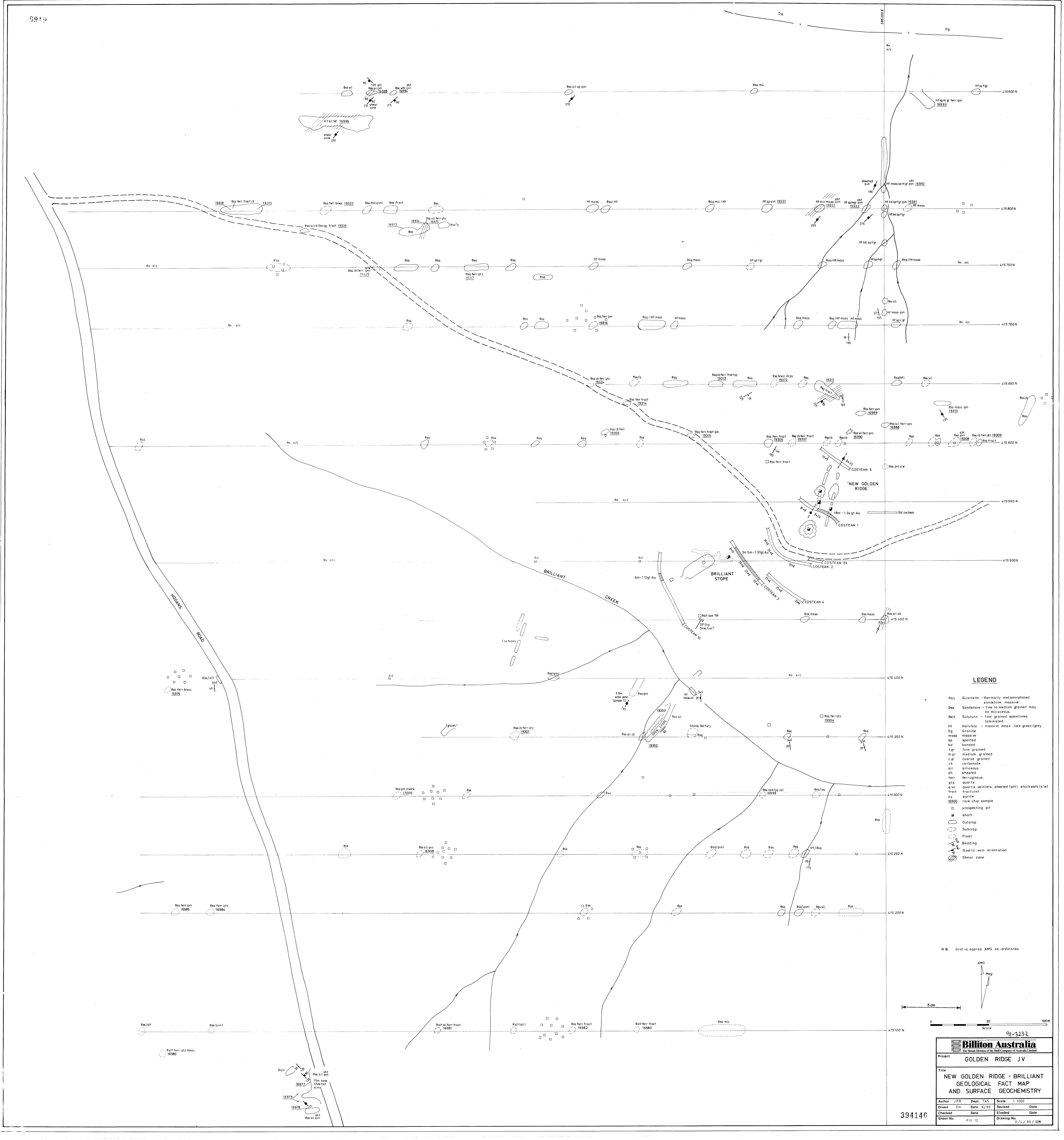
Project: E.L. 58/88
GOLDEN RIDGE J.V.

Title:
GOLDEN RIDGE
COSTEANING PROGRAMME
MAY 1990

Author JPR	Dept. TAS	Scale 1:100	
Drawn OH	Date 5/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 10		Drawing No. D/LJ30/004	

304144


590000E
Hornfelsed Mathinna Beds
HOGANS RD
Poimena Pluton
NEW CARTHAGE
TRAFALGA
NEW GOLDEN RIDGE
GOLDEN RIDGE
BRILLIANT
QUEEN OF THE EARTH
5415000N
570000E
580000E
590000E
430000N
410000N
PYENGANA PLUTON
POIMENA PLUTON
Zone of +0·5gt Au
Zone of ferruginous ± quartz veinlets
Shaft
Adit entrance
Old stope /costean
COSTEAN 5
"NEW GOLDEN RIDGE" WORKINGS
18m @ 1·24g·t Au
COSTEAN 1
"BRILLIANT" STOPE
345m @ 1·37g·t Au
AMG 5415500mN (approx)
COSTEAN 2A
COSTEAN 2
6m@ 1·12gt Au
COSTEAN 3
COSTEAN 4
5 cm
COSTEAN 10
Costeans and small shafts
Pits + Costeans
AMG 585900mE (approx)
MAG
0 10 20 30 40 50metres
Scale
Billiton Australia
The Metals Division of the Shell Company of Australia Limited
Project
GOLDEN RIDGE
Title
NEW GOLDEN RIDGE - BRILLIANT COSTEAN LOCATION AND SIGNIFICANT MINERALIZATION
Author JPR
Date 5/90
Scale 1:2000
Drawn OH
Office TAS
Revised
Date
Drawing No.
Fig No. 11


9919
Dg
586 000 E
No o/c
415 900 N
415 800 N
415 750 N
415 700 N
415 650 N
415 600 N
415 550 N
415 500 N
415 450 N
415 400 N
415 350 N
415 300 N
415 250 N
415 200 N
415 100 N
θss sil
120 sht
θss sil qvn 16995
θss wth qvn 16994
shear zone
H f sil bd 16996
θss sil sp qvn
θss mic
Hf sp f gr
H f sp m gr ferr qvn 16993
19318 θss ferr fract cb 19319
θss ferr brecc 19320
θss mic(qvn)
θss fract.
θss sil cb ferrug. fract 19326
16973
16974
θss sil ferr qtz 16975
θss/q
Hf mass
θsq / Hf
θsq mic / Hf
Hf sp qvn 19321
Hf mic mass qvn 19322
Hf spmgr qvn 19323
sheeted qvn
Hf mass sp m gr qvn 16992
Hf bd spf gr qvn 16991
Hf bd sp f gr
θss cb ferr qvn 19325
θsq ferr qtz 19317
θsq mass
θsq / Hf mass
Hfspmgr
θsq ferr qvn 19316
θss sil
Hf mass qvn
Hf sp c gr
θss cb ferr qtz 19324
θsq cb ferr fract py 19313
θss brecc cb py 19312
19311
θsq fract
θsq(hf)
θss ferr fract 19314
θss ferr qvn 16989
θss mass qvn 19310
θss sil ferr qvn 16988
θsscb
θss cb ferr 19305
θsq ferr fract qvn 19315
θss ferr fract 19306
θss cb ferr fract 19307
θss cb
θss sil ferr qvn 16990
θss qvn 19308
θss cb ferr qtz 19309
θss fract.
θss ferr fract
COSTEAN 5
θss qvn s'w
"NEW GOLDEN RIDGE"
18m - 1·24 gt Au
Old costean
COSTEAN 1
34·5m - 1·37gt Au
COSTEAN 2A
COSTEAN 2
6m - 1·12gt Au
"BRILLIANT" STOPE
COSTEAN 3
COSTEAN 4
Pit
BRILLIANT
CREEK
HOGANS ROAD
Costeans
θslt lam ?hf
20° Dip Direction?
COSTEAN 10
θss mass
θss sil sh
θss/slt
θss ferr brecc 16976
θsq(qvn)
0·8m wide zone Sample 12
θsq qvn
Hf mass sil
19303
OPEN STOPE
θss sil cb
19302
Stamp Battery
θsq ferr qtz 19304
gravel?
θss cb ferr qtz 19301
θss qvn s'work 17000
θss lam (py cb) 16999
θss/sq
θss sil qvn 16998
θsq(qvn)
Hf/θsq
θss ferr qvn 16985
θss ferr qtz 16984
θss sil
θss/slt
θss (qvn)
θslt sil ferr fract 16981
θslt(sil)
θss ferr fract 16982
θslt ferr fract 16983
θss mic
θslt ferr qtz brecc. 16980
θslt
θss sil sht qvn
15m zone sheeted qvns
16977
16979
16978
LEGEND
θsq Quartzite – thermally metamorphosed sandstone, massive.
θss Sandstone – fine to medium grained may be micaceous.
θslt Siltstone – fine grained sometimes laminated.
Hf Hornfels – massive dense dark green/grey
Dg Granite
mass massive
sp spotted
bd banded
f gr fine grained
m gr medium grained
c gr coarse grained
cb carbonate
sil siliceous
sh sheared
ferr ferruginous
qtz quartz
q vn quartz veinlets, sheeted (sht), stockwork (s'w)
fract fractured
py pyrite
16900 rock chip sample
prospecting pit
shaft
Outcrop
Subcrop
Float
Bedding
Quartz vein orientation
Shear zone
N.B. Grid is approx. AMG co-ordinates
AMG
Mag
5 cm
0 50 100 M
Scale
91-3232
Billiton Australia
The Metals Division of the Shell Company of Australia Limited
Project GOLDEN RIDGE JV
Title NEW GOLDEN RIDGE - BRILLIANT GEOLOGICAL FACT MAP AND SURFACE GEOCHEMISTRY
Author JPR Dept. TAS Scale 1:1000
Drawn OH Date 6/90 Revised Date
Checked Date S'ceded Date
Sheet No. FIG 12 Drawing No. D/LJ 30/008
394146

598 000 E

18951 1·5	18952 1·3	18953 3·8	18954 3·8	18955 3·7	18956 3·0	18957 2·3	18958 3·7	18959 2·9	18960 3·3	18961 1·90	18962 2·4	18963 10	18964 1·45	18965 3·1			415 900 N
18950 2·6	18949 4·0	18948 6·5	18947 5·0	18946 6·0	18945 3·6	18944 2·2	18943 2·5	18942 0·90	18941 0·60	18940 3·9	18939 2·1	18938 3·2	18937 2·0	18936 0·60	18935 1·95		415 800 N
																	415 750 N
18918 1·9	18919 0·20	18920 0·10	18921 0·85	18922 0·15	18923 0·20	18924 0·10	18925 0·50	18926 0·85	18927 0·30	18928 1·70	18929 1·80	18930 2·6	18931 10·0	18932 3·0	18933 1·20	18934 0·60	415 700 N
																	415 650 N
18917 0·05	18916 <0·05	18915 0·05	18914 <0·05	18913 0·05	18912 0·30	18911 0·20	18910 1·55	18909 0·25	18908 1·2	18907 1·8	18906 3·2	18905 10	18904 2·8	18903 7	18902 11	18901 2·9	415 600 N
																	415 550 N
19017 0·10	19016 0·05	19015 0·25	19014 0·30	19013 0·35	19012 0·4	19011 1·1	19010 3·6	19009 1·75	19008 19	19007 130	19006 300	19005 80	19004 14	19003 2·6	19002 12	19001 2·0	415 500 N
																	415 450 N
19018 0·15	19019 0·10	19020 0·15	19021 <0·05	19022 0·15	19023 1·40	19024 0·35	19025 0·95	19026 6·5	19027 14	19028 0·28	19029 0·90	19030 2·4	19031 1·50				415 400 N
																	415 350 N
19048 0·25	19047 0·35	19046 20	19045 10	19044 0·40	19043 0·20	19042 1·85	19041 0·80	19040 1·00	19039 1·10	19038 0·95	19037 0·45	19036 1·20	19035 0·40	19034 0·40	19033 0·45	19032 0·70	415 300 N
																	415 250 N
19049 0·25	19050 17	19051 0·30	19052 0·30	19053 0·35	19054 10	19055 0·20	19056 1·05	19057 0·75	19058 0·25	19059 0·35	19060 -	19061 0·10	19062 0·15	19063 -	19064 0·05	19065 -	415 200 N
19082 0·20	19081 <0·05	19080 0·15	19079 0·25	19078 0·25	19077 <0·05	19076 0·20	19075 0·30	19074 <0·05	19073 0·45	19072 2·8	19071 <0·05	19070 <0·05	19069 0·10	19068 <0·05	19067 <0·05	19066 <0·05	415 100 N

10 ppb

2 ppb

10 ppb

10 ppb

2 ppb

10 ppb

19065 Sample No.
0·55 Au ppb
Sample Interval

Statistics (ppb Au)

No samples = 144
Background = <16 ppb
Mildly anomalous = +34 ppb
Strongly anomalous = +63 ppb

AMG
Mag

5 cm

0 50 100 M
Scale

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

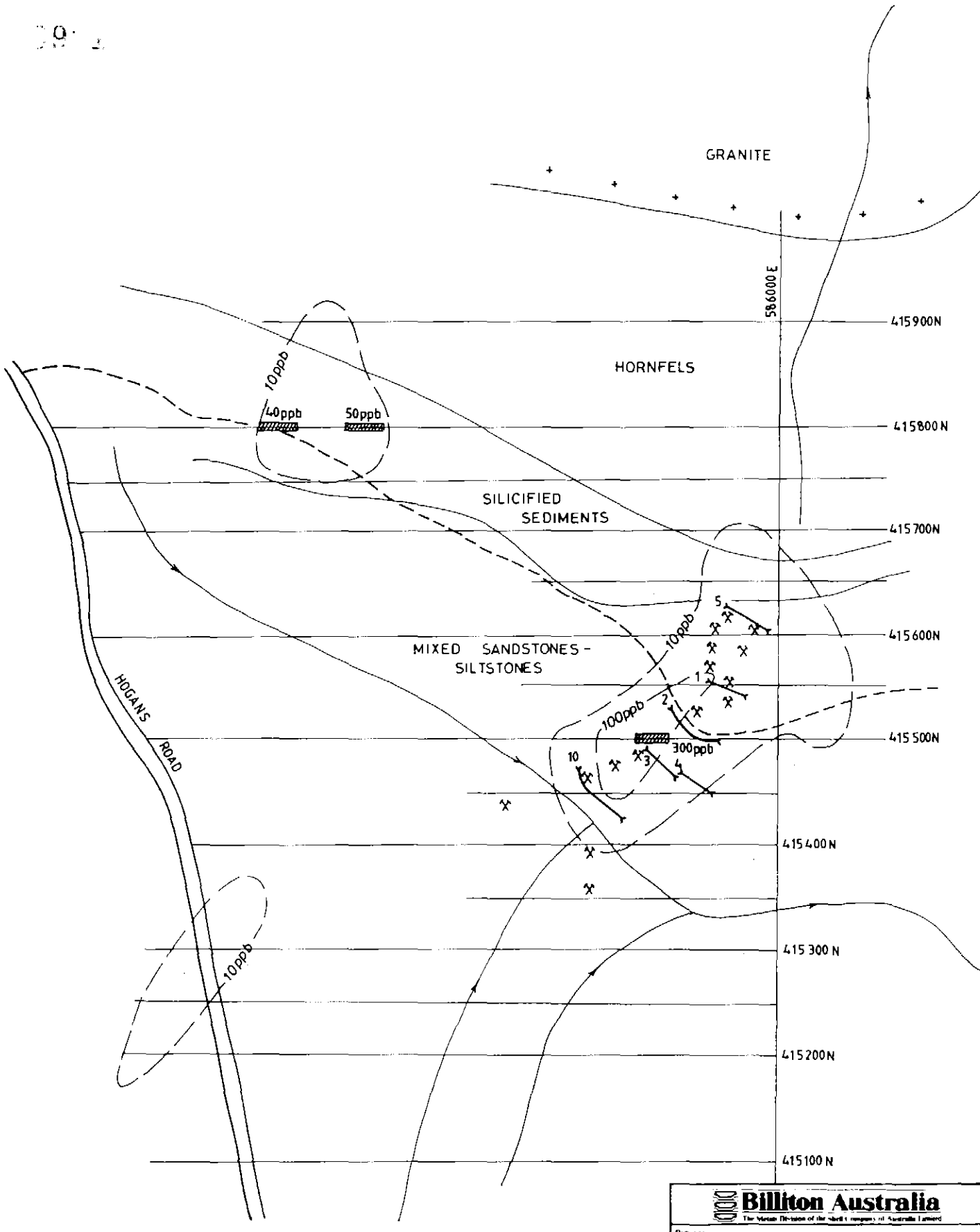
Project: GOLDEN RIDGE

Title: NEW GOLDEN RIDGE - BRILLIANT BLEG SOIL SURVEY

Author JPR	Dept. TAS	Scale 1:1000	
Drawn OH	Date 6/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 13		Drawing No. D/LJ30/009	

91-3232.

394147



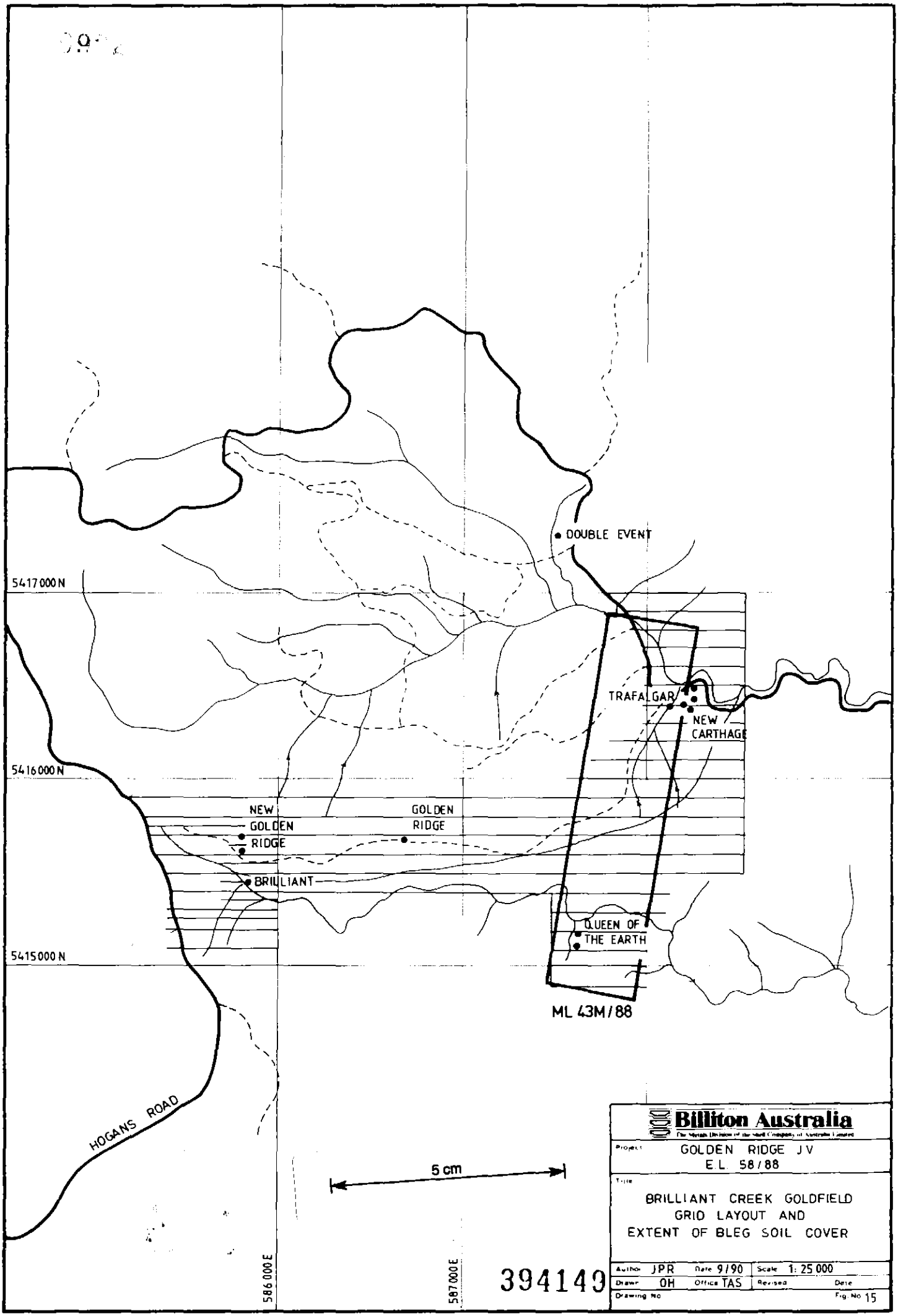
394148

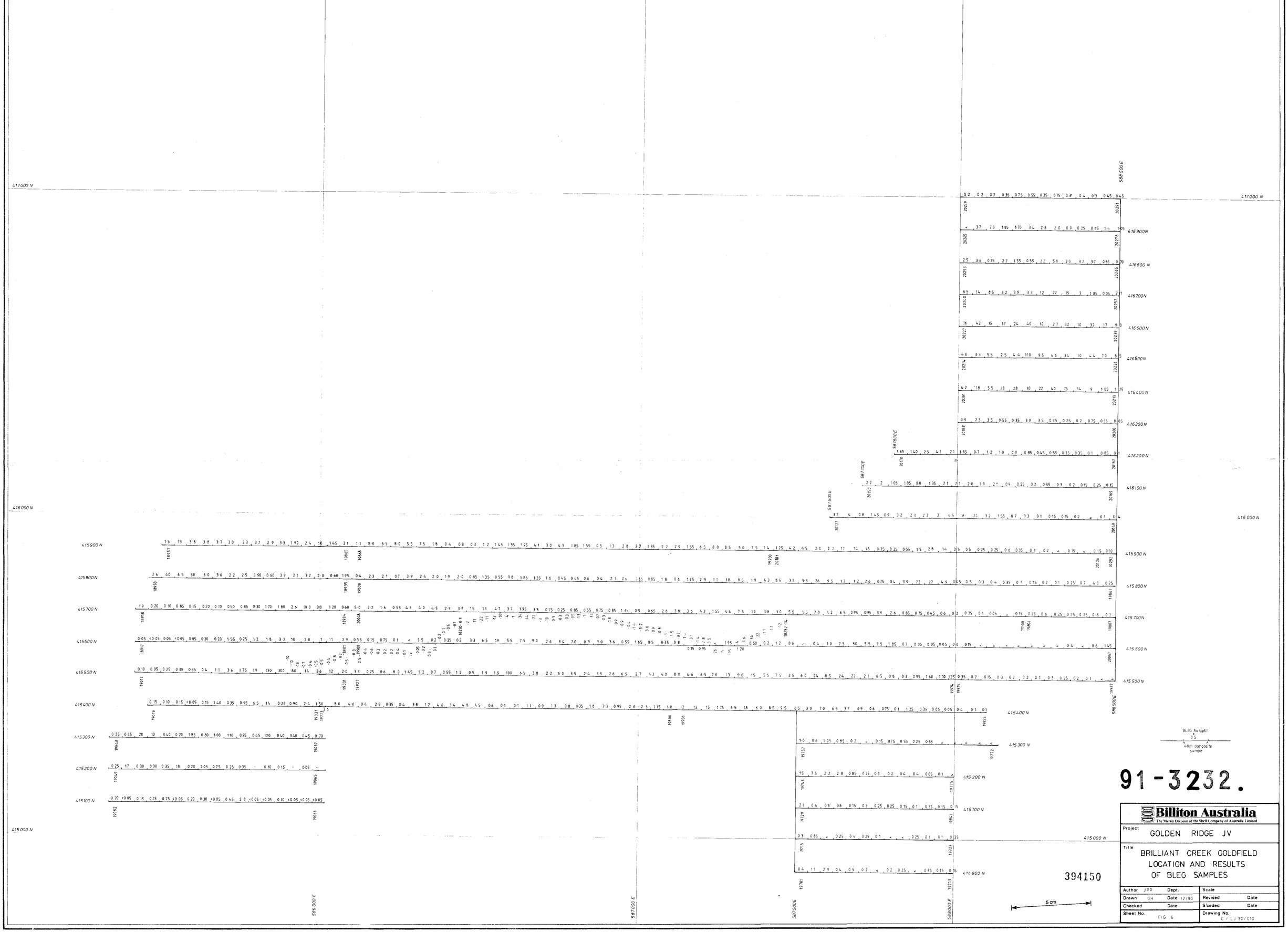
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: GOLDEN RIDGE

Title: NEW GOLDEN RIDGE - BRILLIANT LOCAL SETTING AND BLEG SOIL ANOMALIES

Author JPR	Date 8/90	Scale 1:5000	
Drawn OH	Office TAS	Revised	Date
Drawing No.			Fig No. 14


DOUBLE EVENT
5417000 N
TRAFALGAR
NEW CARTHAGE
5416000 N
NEW GOLDEN RIDGE
GOLDEN RIDGE
BRILLIANT
QUEEN OF THE EARTH
5415000 N
ML 43M/88
HOGANS ROAD
5 cm
586000 E
587000 E
394149
Billiton Australia
GOLDEN RIDGE JV
E.L. 58/88
BRILLIANT CREEK GOLDFIELD
GRID LAYOUT AND
EXTENT OF BLEG SOIL COVER
Author JPR
Date 9/90
Scale 1: 25 000
Drawn OH
Office TAS
Revised
Date
Drawing No
Fig. No 15



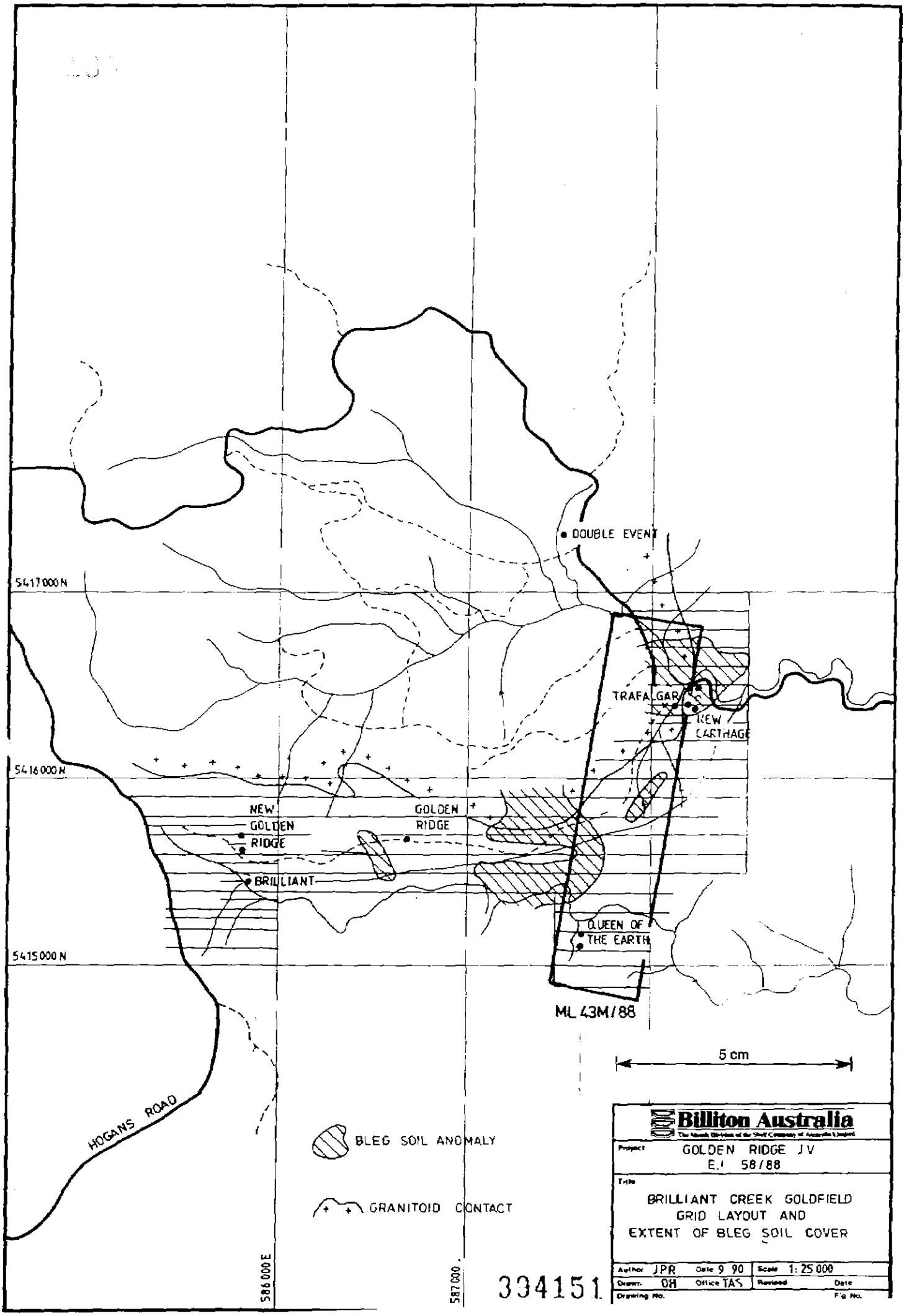
91-3232.

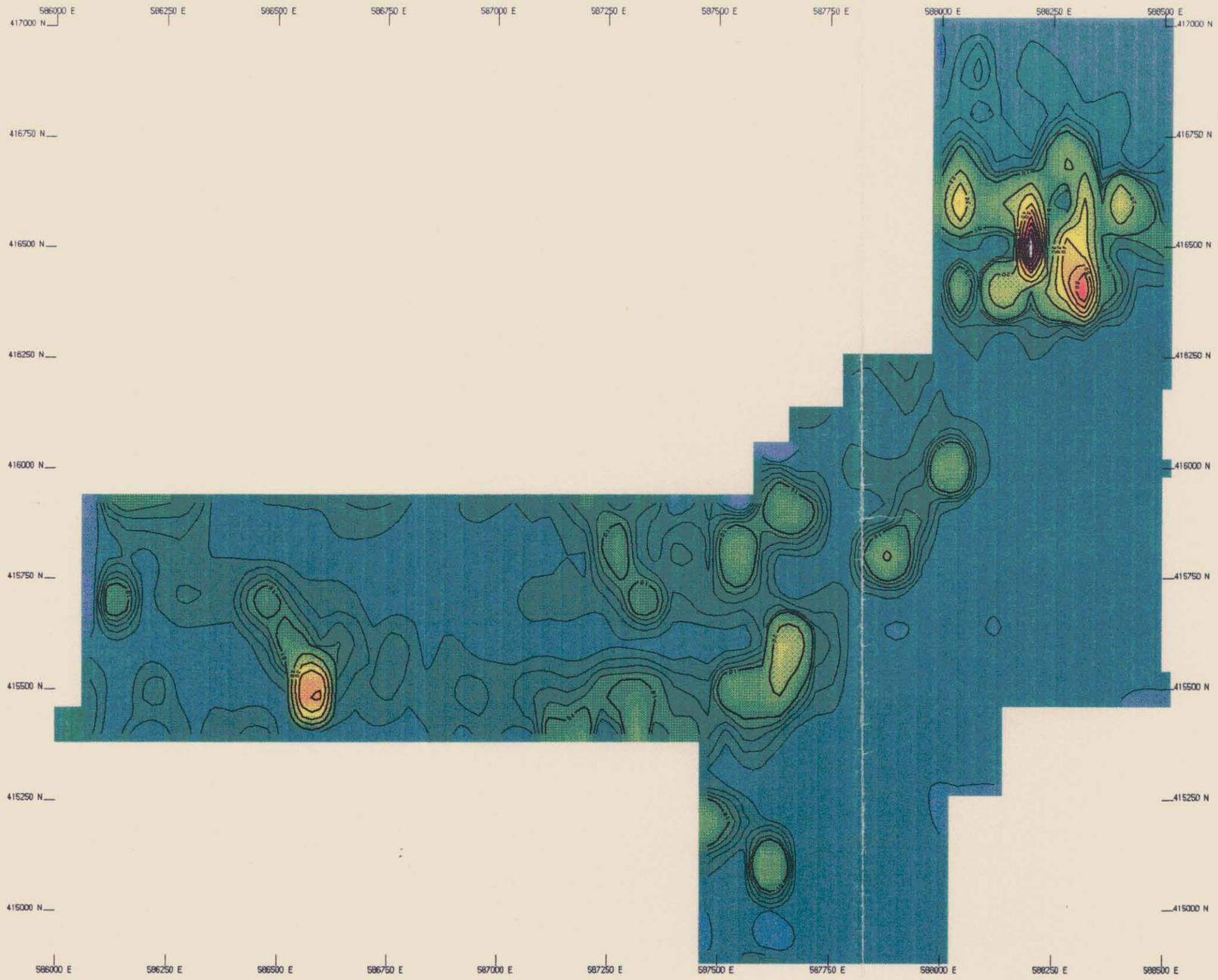
394150

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	GOLDEN RIDGE JV
Title	BRILLIANT CREEK GOLDFIELD LOCATION AND RESULTS OF BLEG SAMPLES

Author JPR	Dept.	Scale	
Drawn CH	Date 12/90	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. FIG 16		Drawing No. CYLJ 30/C10	


DOUBLE EVENT
5417000 N
TRAFALGAR
NEW CARTHAGE
5416000 N
NEW GOLDEN RIDGE
GOLDEN RIDGE
BRILLIANT
QUEEN OF THE EARTH
5415000 N
ML 43M/88
5 cm
HOGANS ROAD
BLEG SOIL ANOMALY
GRANITOID CONTACT
586000 E
587000
Billiton Australia
Project GOLDEN RIDGE JV
E.I 58/88
Title
BRILLIANT CREEK GOLDFIELD
GRID LAYOUT AND
EXTENT OF BLEG SOIL COVER
Author JPR
Date 9 90
Scale 1: 25 000
Drawn DH
Office TAS
Revised
Date
Drawing No.
Fig No.
334151



Scale 1:5000

5 cm

FIG 18

BILLITON AUSTRALIA
GOLDEN RIDGE, TASMANIA BLEG SOIL SAMPLES
.c1. .c2. LINE GRID 40mX40m
BILLITON OPERATIONS COMPUTING

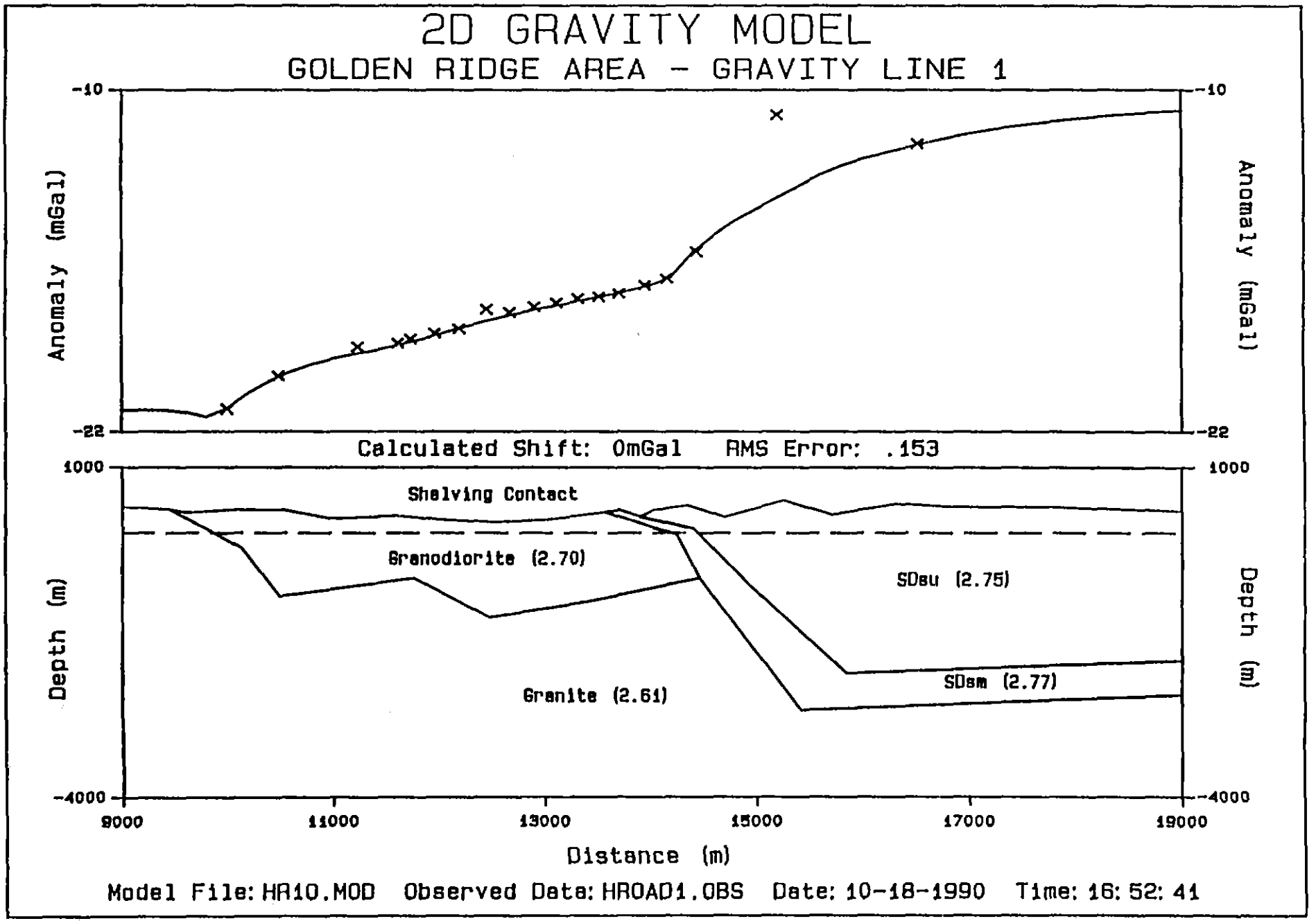


Figure 19