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REPORT ON BEDROCK STUDIES IN RELATION TO TIN PROSPECTS OF THE TERTIARY BASINS OF S.P.L. 323, RINGAROOMA DISTRICT, NORTHEASTERN TASMANIA.

by

J. H. Rattigan

Bedrock studies in relation to tin Prospects of the Tertiary Basins of Ringarooma District by J.H. Rattigan 1-10-58 Copy 1

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REPORT ON BEDROCK STUDIES IN RELATION TO TIN PROSPECTS OF THE TERTIARY BASINS OF S.P.L. 323, RINGAROOMA DISTRICT, NORTHEASTERN TASMANIA.

by

J. H. Rattigan

C O N T E N T S

P L A T E S

INTRODUCTION

A study of the bedrock surface beneath the present dissected surface of Tertiary deposits within our permit areas in N.E. Tasmania has been made with a view to aiding any further exploration of these areas which should be considered warranted.

From this work inferences can be made on a sound basis as to the depth of ground which may be expected in the known deeper channels within the permit areas, thus allowing an appraisal of areas to see whether any could be selected which would warrant testing.

TECHNIQUES USED

To prepare bedrock profiles all available information from boring programmes and records of depths in mine workings was assembled. Surface elevations including the levels of collars of bore holes were obtained by use of aneroid barometers coupled with various reliable existing survey information. Planimetric detail was obtained from surveyed plans or aerial photographs.

In the past little has been done with regard to such work. Various surveyed plans exist but levels were invariably chosen arbitrarily, and the picture of natural and pre-Tertiary bedrock surfaces was somewhat confused by the several datum levels used. In the present study all relevant information concerning levels has been tied in approximately to sea level by using controlled barometric surveying. Two Aneroid barometers were available but as testing showed that the diurnal curves of each instrument at a fixed base were not comparable they were not used in conjunction as a base and field instrument.

Barometric surveying was therefore done by using one instrument after setting up base stations throughout the area and tying in to a main base at Gladstone, the elevation of which was determined in relation to approximate sea level by readings taken on the beach at Boobyalla.

From each base station readings were taken within a limited radius which allowed return to the base station at short intervals (one hour or less) so that a diurnal curve could be plotted with some degree of reliability. Elevations of the base stations with respect to the main Gladstone base were obtained in similar fashion.

A check of the accuracy of barometric levels against surveyed levels at Endurance and on seismic lines in the Boobyalla district showed that reduced levels from barometric surveying were within 5' of accurate survey levels over a distance of 2½ miles from a base station.

It is expected therefore, that over longer distances in unsurveyed ground the maximum error in barometric levelling may be about 15', this figure arising from a possible maximum cumulative error from site of reading to each base station, and from base station to the main base station. In practice the actual error may be much less and in particular the readings taken from each base station (as with all tributary leads) should be within 5 feet accuracy with respect to the level taken as the value of the base stations.

INVESTIGATIONS EARTH MOVEMENTS AFFECTING TERTIARY STRATA

The main aim of the survey was to establish gradients of leads or deeper channels in pre-Tertiary bedrock in areas where positive depth information was available and by projecting the gradients into untested areas, inferring depth to bedrock which could be expected in testing or working.

The question of earth movements in late Tertiary or post Tertiary is an important one since crustal warping, faulting or tilting of strata, if sufficiently strong locally as to have caused major relative displacement of strata as regards the original position when deposited, could nullify such studies as were proposed.

There have, of course, been relative differences in land and sea level in Tertiary and post-Tertiary times, and it can be expected from this and from evidence of vulcanism in the Tertiary that some earth movements have occurred. If this earth movement affected the Tertiary basins merely as part of a broad uniform relative uplift of the present land areas or as a broad upward tilting inwards from the coast line there is little to fear in projecting stream gradients for depth information. If, however, there did occur significant warping on a small scale or major faulting, depth inferences would be liable to great error.

Means of establishing whether such earth movements were significant include observation of geological and/or topographic features. We are not concerned, as far as this study goes, about areas outside the actual Tertiary basins and immediate environs and the following facts were recorded in the present investigation:-

1. No evidence of major faulting was observed in the Tertiary strata. Some minor faults of very small displacement are known from strata on bedrock and may result from rejuvenation of old basement fractures.

2. The higher marginal areas of the Tertiary basins such as the Blue Tier seem to have been essentially pre-Tertiary features. There may have been some Tertiary movement but this would not affect to any great degree the attitude of bedrock in the Tertiary basins. Basalt approximately 1600' higher topographically than that occurring in Ringarooma Valley outcrops in the Weldborough-Blue Tier district but this difference in level cannot be related to faulting as the Tier basalts probably issued from separate vents or fissures over this higher country.

3. The sediments of the Tertiary offer little scope for investigations into such features as warping, as they are lensing and the lithofacies changes rapidly from place to place depending on the type of sedimentation. there are no real marker horizons within the sediments which can be applied to the problem in the present state of knowledge.

4. The junction between the Tertiary basalt and sediments in the Ringarooma Valley is a contact which gives some basis for investigations into earth movements within the Boobyalla basin. Elevations were taken with aneroid barometer at several places in the valley, where an actually exposed junction occurs. It is important to seek actual exposures of the contact and avoid placing reliance on the position of basalt soils as these thick red soils with boulders are particularly liable to "creep". It is also important to take the readings of the basalt junction

on Tertiary sediments and not on pre-Tertiary bedrock where basalt overlies a deeply dissected surface and the elevations have no real value.

As a result of barometric levelling it can be said that over a distance of eight miles north east of Branxholm along the Ringarooma Valley, where the basalt is exposed as a continuous plateau overlying the main Ringarooma Lead, there is little difference in the basalt level. Barometric elevations show the same level (within 15') of about 640' at the Arba Workings, Briseis face and R. Blackwell's farm, north east of Winnaleah (See Plan No. T.464). Thus there is no indication of major warping in the southern areas of our permits especially along the course of the Ringarooma lead.

North of the basalt plateau there is a distance of 14 miles to the coast in which little information is available, as the basalt is largely stripped. Some basalt soils with boulders do occur at an elevation of about 540', but as no actual exposure of the junction is available the only conclusion that can be drawn is that the actual junction occurs at an elevation $>$ 540'.

5. The present Ringarooma River has a fall of about 450 feet from Derby to the mouth at the coast. The direct distance is 20 miles, though the river course is actually of the order of 41 miles. Taking the direct distance the average rate of fall is 22½ feet per mile.

The old Ringarooma Lead as inferred from present knowledge has an outlet near the present river mouth. Over the direct 16 miles from Derby to Seismic Line C there is a fall of about 340 feet or an average rate of fall of about 21¼ feet per mile.

Thus there appears to be little difference in overall grade of the present and former streams and this fact can only support the view that earth movements affecting the Boobyalla Basin are not sufficiently localised to have a major effect on inferences as to depths of bedrock in the Boobyalla Basin.

The conclusions which may be drawn from the above facts are that while there is little doubt that the Tertiary areas of our permits have been involved in some broad earth movements, the local effects of these have not been great enough to cause to any great degree relative disturbance of strata with respect to its attitude on deposition. Thus we can, with some confidence, make inferences as to depth of bedrock in various areas.

BEDROCK PROFILES IN THE RINGAROOMA AND OTHER LEAD SYSTEMS

A series of longitudinal sections along the general course of the Ringarooma Main Lead and its major tributaries, and the Scotia Lead have been constructed and are shown on the plans attached to this report.

These sections are largely self explanatory but a few details concerning construction are given. The depth information is based on workings and bores. The deepest level of bedrock in any bores across or near various sections of the leads are the only ones used. Many are in actual proved gutters of leads. If deeper ground does exist in some areas where bores are not close spaced enough for full information the net effect in any interpretations made from the curves is that bedrock will be deeper. Thus we have fairly sound grounds for inferring the minimum depth of bedrock to be expected ahead of proved sections of leads and in the main Ringarooma Lead Channel once the surface level is known.

The curves show that most worked sections of tributary leads have fairly steep gradients at their heads (e.g. a fall up to 75 feet per 1000 at the head of the Arba Lead). Downstream the gradient falls but it is significant that in all worked sections of tributary leads the gradient is still remarkably steep (greater than 45 feet per mile).

The Ringarooma Main Lead appears to have a fall of about 340' for the direct 16 miles north from Derby to Seismic Line C, or an average grade of 21½ feet pe r mile over this direct distance. As we have no knowledge of the actual detailed course of the stream an accurate measure of grade along the actual stream course is not known.

INFERENCES FROM BEDROCK PROFILES IN RELATION TO TESTING

By analysis of the curves drawn and a knowledge of surface elevations the following inferences are drawn with respect to some economic possibilities within our permits.

1. The worked sections of the tributary leads in the RingaroomaValley all show a steep bedrock gradient (>45' per mile). It follows that the old stream grades were steep enough for cassiterite to have been carried down the lead beyond the worked sections, and that deposits may exist ahead of the working faces. Tin apparently lost in tailings from the Briseis Mine has been carried downstream for up to 5 miles along the present Ringarooma which has a much less steep gradient than exists in unworked tributaries. This has been concentrated on recent beaches and worked continuously after each wet season by small parties for good returns.

2. The reasons why working ceased in several tributary leads is quite apparent from the profiles. The combination of falling bottom and higher surface topography resulted in a much greater working depth and lessening of grade due to greater proportion of virtually barren overburden.

3. While tin concentrations are believed to remain ahead of worked sections there appears to be no prospect of any reasonable yardage with values approaching 0.5 lb. cassiterite/yard or working depths less than 120' along the Arba, Cascade, Weld or Pioneer Leads. Thus there is little attraction for further exploration along these leads. The Endurance Lead, held under lease, has at least 5,000,000 yards indicated with values of the order of 0.5 at depths less than 135', and is fortunate in that the natural surface is falling as the bottom falls down the lead.

4. The inferred profile of the Main Ringarooma Lead has been plotted on Plan No. T.464. Also plotted are rough curves illustrating the maximum and minimum topographic surface levels likely to be met with along the course of the lead. These latter are not section lines but show the range of surface elevation over which boring would have to be carried out to test the lead along its course. The line of minimum curve relates to creek bottoms and flats, and in these areas the minimum possible testing depth of the gutter of the lead in any section across the lead valley can be inferred. It is to be noted that it would be very fortuitous if the lead passed under such creeks or flats and even if it did very little yardage would be available at such a minimum depth as the lead would soon pass under higher country.

From these curves the reason why the coastal area A was chosen for seismic survey and later testing is quite apparent, as it is the only area which offers uniform and shallow testing along the course of the lead. Comments on sections of the inferred main lead are set out below:-

(i) Between Branxholm Creek and Derby

Beneath the Ringarooma River and adjoining alluvial flats the old Ringarooma lead may be at depths of 200' or more (much greater if it passes under basalt terrain). In this section most of the richer tributaries would not have entered the main lead and this lessens the attraction for testing.

(ii) Basalt Plateau, Northeast from Derby to Winnaleah

The curves show clearly that testing depths and working depths would range from 500 feet to more than 700 feet and this has no attraction for testing. It is doubtful whether values would be good enough to warrant mining by underground methods.

(iii) Between Winnaleah and Area A

Testing depths would range generally from 200 feet to 500 feet. It would be sheer luck if the minimum testing depth were less than 250' and only possible if the lead gutter was hit beneath a stream bottom. As an illustration we may take course of the Little Boobyalla River which was at one time proposed as a testing line. The river bottom a mile north west of Sheoak Hill where the lead may be inferred to pass has an elevation of about 375'. The Ringarooma Lead gutter in this area can be inferred to have an elevation of 80' so that testing would involve a hole of about 300' to intersect the gutter in the stream bed.

(iv) Area A

Limited testing of this area was not conclusive. It appears improbable the hole GB4 on seismic line A could be sited on the lead gutter as the gradient between bedrock in GB4 and GB3 is too great to be reasonable. (Refer "Final Report on REAH 1958 Boring"). As originally expected, and confirmed following the control for the longitudinal profile from boring on seismic line G, the area offers the only hopes of testing over a wide area to depths of 75' to 150'.

The scouting completed in the area showed no bottom tin deposits, and an estuarine sequence at depth. The presence of estuarine clays and sands do not rule out the possibility of buried alluvials, as under Fosters Marshes to the north stanniferous shingle is developed beneath estuarine muds and fine sands. However, it would be unreasonable to expect cassiterite of the coarser sizings to have been carried so far downstream from Derby, and if any concentrations occur in Area A they must necessarily have been derived in great part from the nearer tributaries.

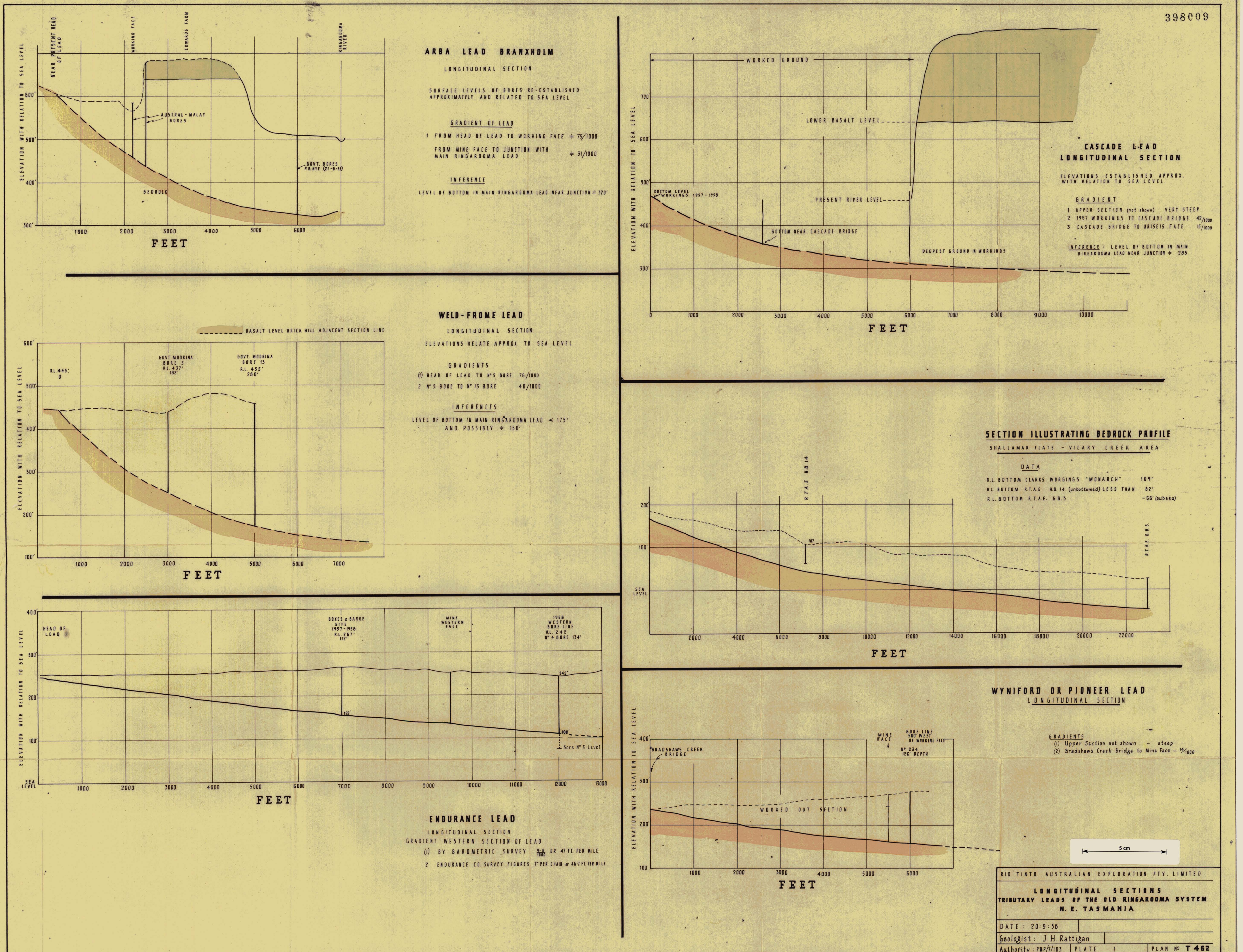
General conclusions that can be made with respect to the Ringarooma Main Lead are that there is little scope for shallow testing and it is doubtful whether we could reasonably expect economic values in the main stream in view of the great depth of relatively barren overburden expected.

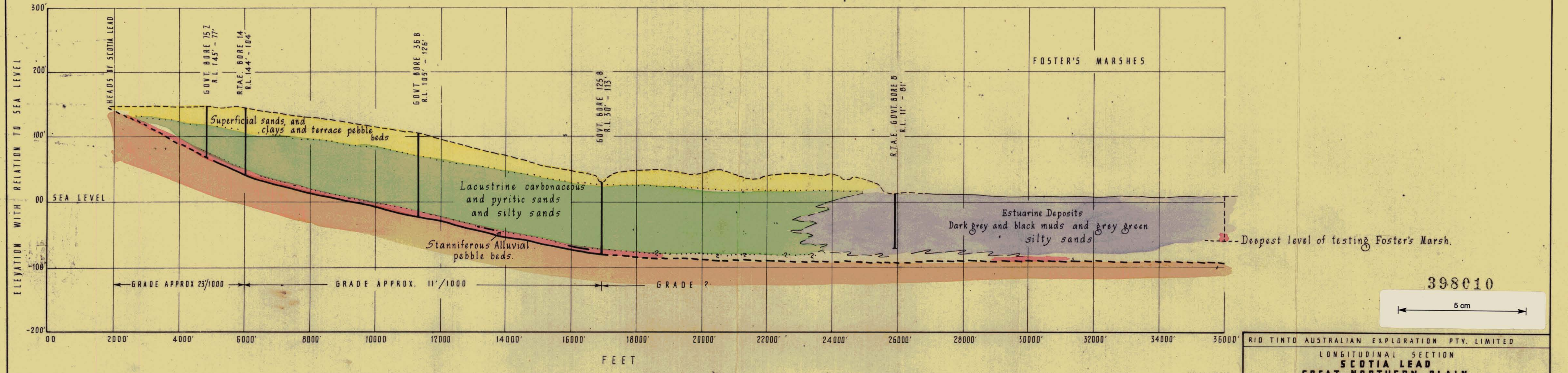
5. The best hopes of economic deposits within our permits lie in the discovery of virgin tributary leads in marginal areas of the Tertiary basins. This type of deposit could result in moderate scale mining operations. The type of ground referred to is that which would be similar to that shown in the longitudinal profiles of the Endurance Lead and Shallamar Flats-Vickary's Creek area, where possibilities of tin deposits within depths of 120' subsurface might be proved.

6. The profile of the Scotia Lead has some interesting features in that at Stinking Creek the bedrock elevation in the lead gutter has an elevation of 83 feet below sea level. As this lead is inferred to have an outlet in the Fosters Marshes Area it might be expected that a bottom level of 100 feet below sea level exists somewhere on Foster's Marshes. As the deepest boring on the Marshes has reached only 65' below sea level there remains the possibility of testing a possible deep channel. The Scotia Lead of itself offers no attraction as an economic proposition but could have contributed some cassiterite along with other sources. A fairly consistent stanniferous bottom shingle ranging up to 21 feet (average 13') has been proved over part of the Marshes area, and full depth of ground averages 0.13 lbs/yard (cassiterite). It would be optimistic to expect values to be greater than 0.25 lb/yard even were a deeper channel proved and this would have little attraction under present conditions even were a huge yardage proved as such values at this depth would leave no margin for an operating profit.

<u>1st October, 1958</u>.

<u>J.H. Rattigan</u>,
<u>Geologist</u>.


398009
ARBA LEAD BRANXHOLM
LONGITUDINAL SECTION
SURFACE LEVELS OF BORES RE-ESTABLISHED APPROXIMATELY AND RELATED TO SEA LEVEL
GRADIENT OF LEAD
1 FROM HEAD OF LEAD TO WORKING FACE ÷ 75/1000
FROM MINE FACE TO JUNCTION WITH MAIN RINGAROOMA LEAD ÷ 31/1000
INFERENCE
LEVEL OF BOTTOM IN MAIN RINGAROOMA LEAD NEAR JUNCTION ÷ 520'
NEAR PRESENT HEAD OF LEAD
WORKING FACE
EDWARDS FARM
RINGAROOMA RIVER
AUSTRAL-MALAY BORES
GOVT. BORES
BEDROCK
ELEVATION WITH RELATION TO SEA LEVEL
FEET
CASCADE LEAD
LONGITUDINAL SECTION
ELEVATIONS ESTABLISHED APPROX. WITH RELATION TO SEA LEVEL.
GRADIENT
1 UPPER SECTION (not shown) VERY STEEP
2 1957 WORKINGS TO CASCADE BRIDGE 42/1000
3 CASCADE BRIDGE TO BRISEIS FACE 15/1000
INFERENCE : LEVEL OF BOTTOM IN MAIN RINGAROOMA LEAD NEAR JUNCTION ÷ 285
WORKED GROUND
LOWER BASALT LEVEL
PRESENT RIVER LEVEL
BOTTOM LEVEL WORKINGS 1957-1958
BOTTOM NEAR CASCADE BRIDGE
DEEPEST GROUND IN WORKINGS
WELD-FROME LEAD
LONGITUDINAL SECTION
ELEVATIONS RELATE APPROX TO SEA LEVEL
GRADIENTS
(1) HEAD OF LEAD TO Nº 5 BORE 76/1000
2 Nº 5 BORE TO Nº 13 BORE 40/1000
INFERENCES
LEVEL OF BOTTOM IN MAIN RINGAROOMA LEAD < 175'
AND POSSIBLY ÷ 150'
BASALT LEVEL BRICK HILL ADJACENT SECTION LINE
R.L. 445'
GOVT. MOORINA BORE 5 R.L. 437' 182'
GOVT. MOORINA BORE 13 R.L. 455' 280'
SECTION ILLUSTRATING BEDROCK PROFILE
SHALLAMAR FLATS - VICARY CREEK AREA
DATA
R.L. BOTTOM CLARKS WORKINGS "MONARCH" 169'
R.L. BOTTOM R.T.A.E. H.B. 14 (unbottomed) LESS THAN 62'
R.L. BOTTOM R.T.A.E. G.B. 3 -56' (subsea)
R.T.A.E. H.B. 14
R.T.A.E. G.B. 3
SEA LEVEL
ENDURANCE LEAD
LONGITUDINAL SECTION
GRADIENT WESTERN SECTION OF LEAD
(1) BY BAROMETRIC SURVEY 9·5/1000 OR 47 FT. PER MILE
2 ENDURANCE CO. SURVEY FIGURES 7" PER CHAIN or 46·7 FT PER MILE
HEAD OF LEAD
BORES & BARGE SITE 1957-1958 R.L. 267' 112'
MINE WESTERN FACE
1958 WESTERN BORE LINE R.L. 242 Nº 4 BORE 134'
Bore Nº 3 Level
WYNIFORD OR PIONEER LEAD
LONGITUDINAL SECTION
GRADIENTS
(1) Upper Section not shown - steep
(2) Bradshaws Creek Bridge to Mine Face - 14/1000
BRADSHAWS CREEK BRIDGE
MINE FACE
BORE LINE 500' WEST OF WORKING FACE Nº 234 126' DEPTH
WORKED OUT SECTION
5 cm
RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED
LONGITUDINAL SECTIONS
TRIBUTARY LEADS OF THE OLD RINGAROOMA SYSTEM
N. E. TASMANIA
DATE : 20·9·58
Geologist : J. H. Rattigan
Authority : PMP/7/103
PLATE 1
PLAN Nº T 462



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RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

LONGITUDINAL SECTION
SCOTIA LEAD
GREAT NORTHERN PLAIN
N.E. TASMANIA

DATE: 20th September, 1958	AUTHORITY: PRP/7/103	PLATE 3
GEOLOGIST: J.H. Rattigan	DRAFTSMAN: D.J. Lawford	PLAN Nº T 463

398011

Represents maximum surface elevations in progressive cross sections across the inferred deep lead valley course.

Represents minimum surface elevations in progressive cross sections across the inferred deep lead valley course.

(1) DEPTHS OF BOTTOM IN BORES RELATED TO SEA LEVEL.

(2) ACTUAL GUTTER NEVER PROVED BY BORING, SO THAT BEDROCK SURFACE WILL BE DEEPER.

N.B. AVERAGE GRADIENT BETWEEN DERBY AND THE SEA COAST 18 FT. PER MILE

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED		
GENERAL LONGITUDINAL SECTION INFERRED RINGAROOMA MAIN LEAD		
DATE: 20th September 1958	AUTHORITY: PRP/7/103	PLATE: 2
GEOLOGIST: J.H. Rattigan	DRAFTSMAN D.J. Lawford	PLAN Nº T 464

5 cm