



Annual Report
for EL9/2011 Monarch Flats
for the Period 14 August 2014 to 13 August 2015

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ABSTRACT

This report describes the exploration activities completed within EL9/2011 during the period 14 August 2014 to 13 August 2015. This is the fourth annual report for the fourth year of grant of the Tenement.

The Tenement is located north-west and south-west of the town of Gladstone.

There has been a long history of prospecting since the mid 1870s, and mining for alluvial tin was carried out between 1874 and 1982.

The Tenement covers several major past producer alluvial tin mines, including Pioneer, Endurance, Monarch, New Dorset Dredge, and Scotia, and many smaller alluvial deposits. Past placer production is about 20,000t cassiterite, including:

- Pioneer - 10,814t
- Endurance- 6,240t
- Scotia - 1,270t
- New Dorset Dredge - 762t
- Monarch - 479t

The company's main focus is exploration for tin, in alluvial deposits and in bedrock.

Work done by Tin Dragon during the period consisted of

1. Assessment of the prospectivity of the area for basement tin and tungsten mineralisation.
Assessment of the area for the following commodities: Sapphires and other gemstones, Gold, Zircon, Monazite and other heavy minerals, Clay and Rare Earth Elements.

KEYWORDS

NE Tasmania
 Geology
 Mineralisation
 Alluvial
 Paleochannel
 Leads
 Primary Deposits
 Granite
 Mathinna Group
 Exploration Targets
 Tin
 Tungsten
 Clay
 Sapphire
 Zircon
 Monazite
 Rare Earth Elements

**SUMMARY OF ACTIVITIES for EL9/2011 Monarch Flats
for the Period 14 August 2014 to 13 August 2015**

Work done by Tin Dragon during the period consisted of

Assessment of the area for basement tin and tungsten mineralisation.
 Assessment of the area for the following commodities:-
 Sapphires and other gemstones
 Gold
 Tantalum
 Zircon, Monazite and other heavy minerals
 Clay
 Rare Earth Elements

CO-ORDINATES

All lat/long co-ordinates in this report refer to the GDA94 Datum, unless stated otherwise.
 All AMG co-ordinates in this report refer to the GDA94 - Zone55, unless stated otherwise.

FILE SUMMARY LIST

File name	Format	Contents
EL9-2011_2015_report.pdf	pdf	Annual Report

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1.0 INTRODUCTION

This report describes the exploration activities completed within EL9/2011 (The 'Tenement') during the period 14 August 2014 to 13 August 2015. This is the fourth annual report for the fourth year of grant of the Tenement.

For Tin Dragon's convenience the project is named "Pioneer", rather than the MRT designator of Monarch Flats.

The Tenement is located north-west and south-west of the town of Gladstone, Fig.1.

Table 1 - Tenement Details

Tenement	Holder	Date Applied	Date Granted	Size
EL9/2011 Monarch Flats	Tin Dragon Pty Ltd 100%	28 February 2011	13 August 2011 (Categories 1 and 5)	103km ²

Excluded from the grant of the tenement are two small mining leases granted only for Category 3 Construction Minerals, (not for Category 1 Minerals and Category 5 Minerals such as tin and sapphires):-

8M/1993 10 ha, Dorset Council

10M/2008 86 ha, Sanbar Pty Ltd.

Crown Land covers most past mines and resources and prospective areas, and Private Land the remainder. There are no restrictive Reserves.

The project lies within the Tasmania NE (SK55-21) 1:250,000 map sheet, and the 1:25,000 map sheets of Tomahawk, Musselroe, Monarch, Gladstone, Pioneer and Lanka.

Access is via sealed roads, formed local roads and other rough tracks.

The Tenement covers several major past producer alluvial tin mines, including Pioneer, Endurance, Monarch, New Dorset Dredge, and Scotia, and many smaller alluvial deposits.

The company's main focus is exploration for tin, in alluvial deposits and in bedrock.

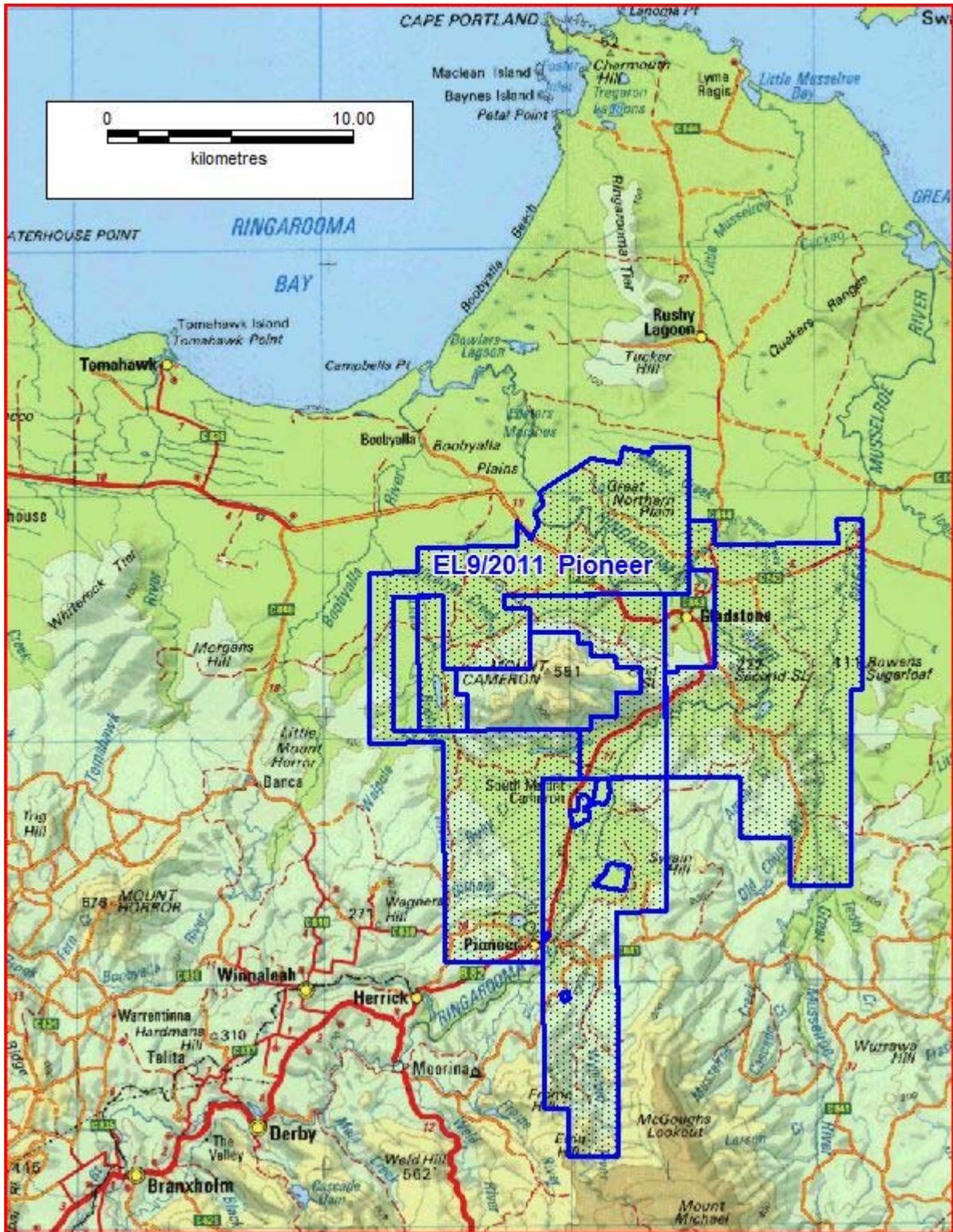


Fig. 1 Tin Dragon Tenement Locations

2.0 GEOLOGICAL SETTING and MINERALISATION

The area is characterized by relatively poor outcrop. Much of the basement rocks are covered with various types of unconsolidated sediments, most of which are tin bearing.

Nearly all known metallic deposits in the Tenement are alluvial tin (with accessory gold, monazite, sapphires) hosted in paleochannels (leads), Fig 2. Some tin deposits in basement rocks occur around Gladstone, but this area is outside the Tenement. Given the widespread alluvial occurrences, the lack of known tin mineralisation in basement is striking.

Past placer production is about 20,000t cassiterite, including from these main deposits:

- Pioneer - 10,814t
- Endurance- 6,240t
- Scotia - 1,270t
- New Dorset Dredge - 762t
- Monarch - 479t

In the region the original sources of the tin were phases of the Devonian tin-bearing granites of the Blue Tier Batholith, where tin occurs as cassiterite in quartz and greisen vein systems in the roof zone of the granites near the contact with overlying Silurian Mathinna Beds.

A generalised history of development of the region's alluvial deposits is as follows:-

During Middle Eocene time (ca 46Ma) volcanic activity commenced along the Blue Tier with the extrusion of the Older Basaltic lava flows. It is likely that these were emplaced along stream valleys incised into the pre-Eocene granitic land surface, and so buried the older alluvial cassiterite deposits.

From the Mid Eocene to Late Oligocene (ca 46 to 24Ma) uplift and a humid tropical climate resulted in rapid erosion of the basalts, and renewed liberation of cassiterite from granites and reworking and upgrading of the earlier pre Middle Eocene alluvial deposits. The Middle Miocene (ca 14Ma) saw a second period of basaltic volcanism with extensive lava flows down many of the larger valleys in the Derby area.

Post Middle Miocene to Recent alluvial deposits were then formed along the alluvial flats of the major rivers.

In areas closer to the present coast there were marine incursions which have reworked the earlier alluvials.

In summary there has been a complex history of placer formation involving reworking and reconcentration of cassiterite.

those surrounding it because it has a prominent airborne thorium (and U and K) response, Fig 3.

Mt Cameron stands prominently in an otherwise flat landscape. Geomorphologically this attests to a neotectonic origin; it is interpreted to be a pop-up horst structure resulting from regional compression. The neotectonics are postulated to be no older than Eocene, and the main movement is likely to much younger, namely Miocene or younger, because otherwise erosion would have levelled the hill closer to the prevailing plain level. The bounding faults are not directly mapped though must occur near the change of slopes. These faults will be close to or on the contacts of the thorium rich granite phase. More discussion on the neotectonics of Mt Cameron can be found in Section 8.0.

Apart from a mineralised area south of Gladstone, outside Tin Dragon tenements, the central massif area contains no known mineralisation. It is possible that prior to uplift the carapace was mineralised with tin bearing greisen sheets and vein systems, but these have been entirely eroded and thus have contributed the tin (cassiterite) to the peripheral alluvial tin deposits such as Monarch, Endurance and Clarence.

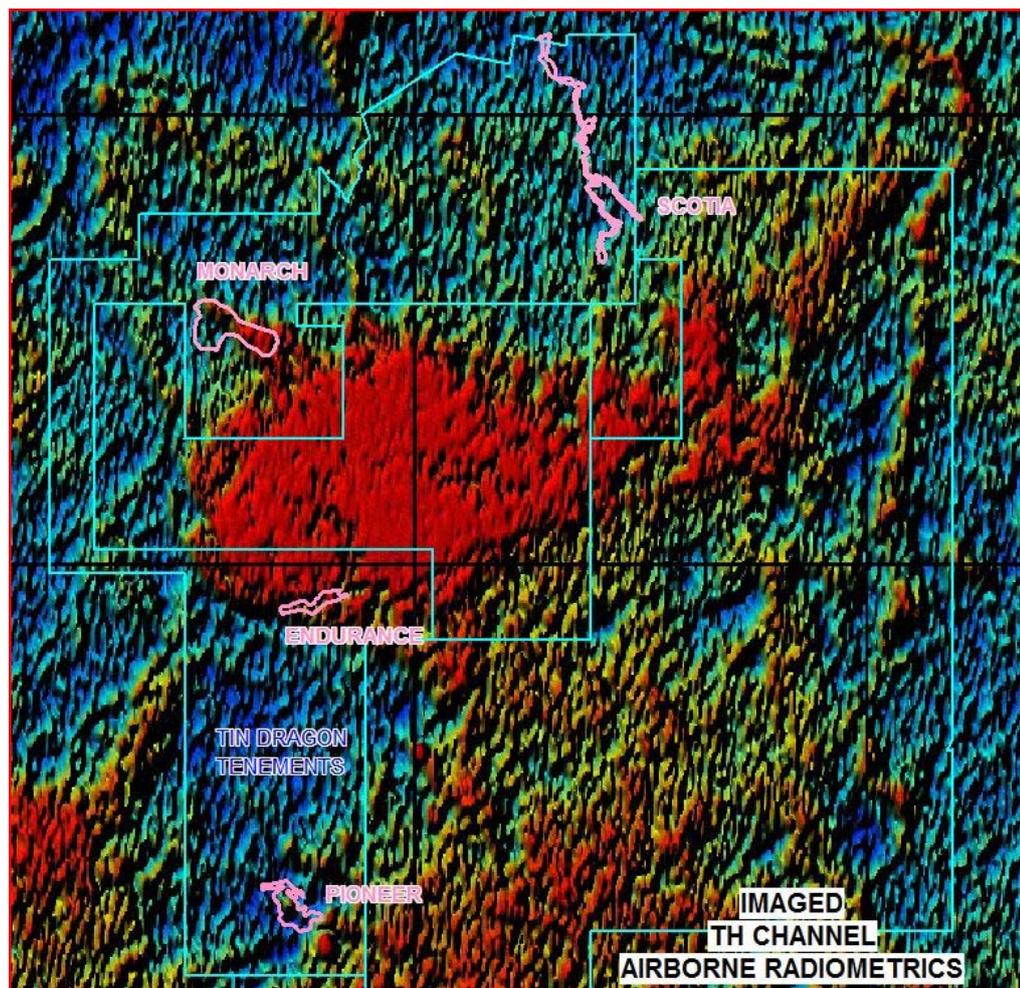


Fig 3. Intense Thorium anomaly corresponding to the Mt Cameron granite body.

3.0 REVIEW OF PREVIOUS WORK

A generalised history of mining in the area was presented in Tin Dragon's first annual report and is not repeated here.

There has been very extensive and intensive exploration for alluvial tin in the Tenement, and no attempt is made to summarise that here.

Instead, work done by various companies and the Tasmanian Department of Mines has been covered within chapters covering the main mineralised areas in this report and in the second and third annual reports.

Work reported in Tin Dragon's second annual report (to August 2013) covered a review of previous exploration and mining of, and a field visit to, the Scotia, Monarch and Pioneer Deposits.

Work reported in Tin Dragon's third annual report (to August 2014) covered an evaluation of past stream sediment geochemical exploration, compilation and evaluation of previous company exploration for the New Dorset Dredge area and the Ringarooma Flats area, plus an evaluation of the potential for extensions of the Monarch deposit and a re-appraisal of the Scotia Deposit.

4.0 EXPLORATION COMPLETED DURING THE REPORT PERIOD

Work done by Tin Dragon during the period consisted of

Assessment of the area for basement tin and tungsten mineralisation.

Assessment of the area for the following commodities:-

Sapphires and other gemstones

Gold

Tantalum

Zircon, Monazite and other heavy minerals

Clay

Rare Earth Elements

5.0 BASEMENT MINERALISATION

Introduction

This section attempts to assess the potential in bedrock for primary deposits of tin and tungsten in the Tenement. Apart from the known small vein quartz-cassiterite deposits, which are outside Tin Dragon's tenements south of Gladstone, there is no known basement mineralisation, a very surprising fact because there is such an extensive suite of placer deposits containing more than 40 000t of cassiterite.

The potential for primary tin resources in the Tin Dragon areas, in our view, has not been addressed by previous owners of the deposits and leases.

There is a natural tendency for alluvial miners to seek alluvials and not bedrock tin sources- and vice versa for hard rock explorers.

The cassiterite in the placers has traditionally been thought to have been derived from the main mass of Blue Tier Batholith, which is well to the south of the Tin Dragon tenements. This view is almost certainly incorrect and there must exist sources of cassiterite much nearer to the placers. For such deposits no previous exploration is recorded.

It is likely that prospectors have been hindered in the discovery of hard rock mineralisation by the extensive sand cover in the region and the scrubby vegetation. Furthermore mineralised weathered bedrock, if it had been intersected in some of the numerous drilled for placer exploration, is likely to have gone unrecognized, having been mistaken for clayey alluvium.

Styles of mineralisation could include:

- Veins in cupola positions in the granite, similar to the Aberfoyle-Storeys Creek deposits.
- Sheeted quartz vein systems hosted in granite and/or Mathinna beds, similar to the Taronga deposit in the New England district,
- Cassiterite coating joints in Mathinna beds, as occurs at Great Pyramid south of St Helens,
- Greisen bodies within granite at the upper contact zone with Mathinna Beds; this style of mineralisation is known south of Gladstone in the Fly-by-Night area (Twelvetrees, 1916),
- Pegmatite bodies or swarms within granite.

Tungsten (wolframite) is known in the quartz vein deposits south of Gladstone, outside the Tenement. There is no known tungsten resource in the Tenement, primary or placer. Tungsten minerals are soft and would not survive the probable reworking processes that the placer deposits have undergone, thus explaining their absence even if bedrock sources exist(ed). In Tasmania there is a well-known zonation around granite cupolas of vein style mineral deposits of proximal tungsten, tin, and Cu-Sn to more distal Ag-Pb-Zn. There is likelihood that primary tungsten deposits may be found associated with primary tin deposits.

A target expectation would be 5 to 20Mt at 0.25-0.6 % cassiterite—a 30,000 tonne deposit.

The work of Yim (1990)

Yim [Yim, Wyss W S (Wyss Wai Shu) (1990), Heavy mineral provenance and the genesis of stanniferous placers in northeastern Tasmania. Thesis (Ph.D.)--University of Tasmania.] has discussed at length tin placers in NE Tasmania, and concluded that the deposits with economically attractive grades have (or had prior to erosion) a bedrock source of cassiterite within 1km.

His lines of evidence include the coarse maximum grain sizes of cassiterite which could not have survived long transport distances, the presence of proximal eluvial and colluvial characteristics in the placers, a heavy mineral grain particle size distribution indicative of sorting typical of proximal deposits, the co-presence of grains of nuggety gold which could not have travelled far, and a suite of distinctive cassiterites recognizable by their localised trace element (Nb, Ta etc) signatures.

His sampling is of great relevance because it was undertaken mainly from active mines readily accessible in the early 1980s, and such deposits include from within or near this Tenement the following: Pioneer, Endurance (plus Clifton, on the north flank of Endurance), Hasties (Clarence), Monarch, Scotia and Lochaber, McGregor Delta Taylor etc (Ringarooma Flats), Ah Kaw Ck/ Sextus Ck (north flank of Mt Cameron), and the Wyniford deposits of Flintstone, How the West, Wildcat, and Blackberries, (see fig 4 below).

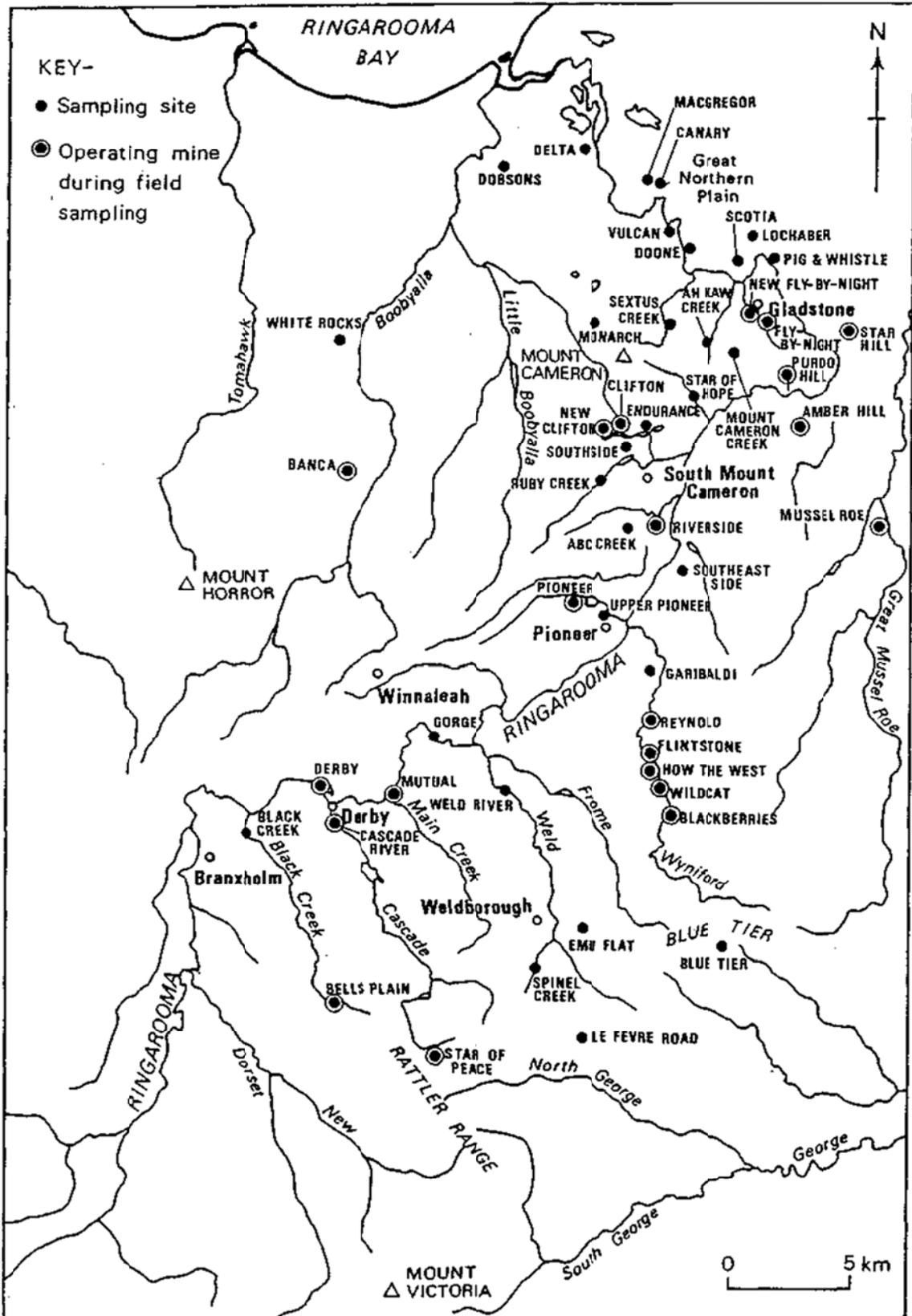


Fig 4 Location map of sampling sites (Fig 3.1 in Yim 1990)

The course maximum size of cassiterite grains in the sampled deposits is illustrated in Fig 5 below. It attests to a proximal basement source for most deposits, and thus not a Blue Tier source.

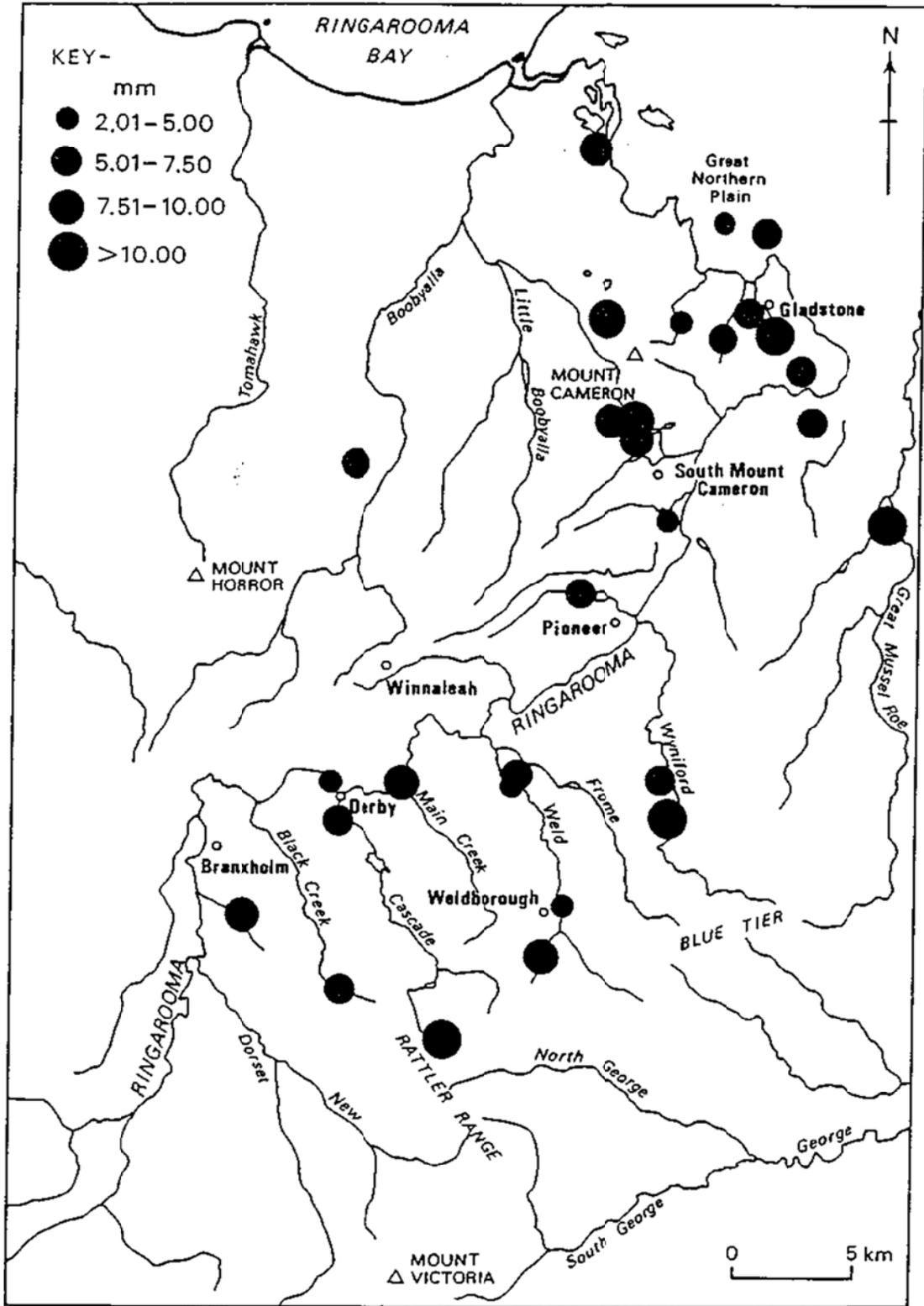


Fig 5 Distribution/ maximum diameter of monomineralic cassiterite grains (fig 4.1 in Yim 1990)

Yim has recorded the presence of gold in the following deposits: Endurance, Ah Kaw Ck, Lochaber, MacGregor and the nearby deposits.

An extract of Yim's trace element analyses (ppm) of cassiterite from various deposits is reproduced below. Notice the distinctive signatures of the various deposits, reflecting different sources. Pioneer for example is shown by many authors as part of the Wyniford lead, yet it clearly does not have the same signature as the Wyniford system's Blackberries deposits, strongly suggesting that the Wyniford area is not the source of the Pioneer cassiterite.

ppm	Nb	Ta	W	Zr
Bells Plain	946	88	867	241
Blackberries	532	44	796	236
Blackberries 4	547	85	715	232
Cascade Creek	1017	109	964	251
Mutual	573	5	1071	236
Pioneer	1502	566	1194	1425
Reynolds	781	320	1027	234
Star of Peace	1429	234	1570	85
Wildcat	665	78	871	236
Clifton	1744	435	912	350
Fly-by-night	1513	356	604	225
Monarch	1350	365	663	345
New Clifton	1880	455	609	279
Purdo Hill	3343	2488	699	1498
Amber Hill	763	173	750	749
Banca	895	30	1184	100
Delta	767	400	644	341
Mussel Roe	594	178	824	191

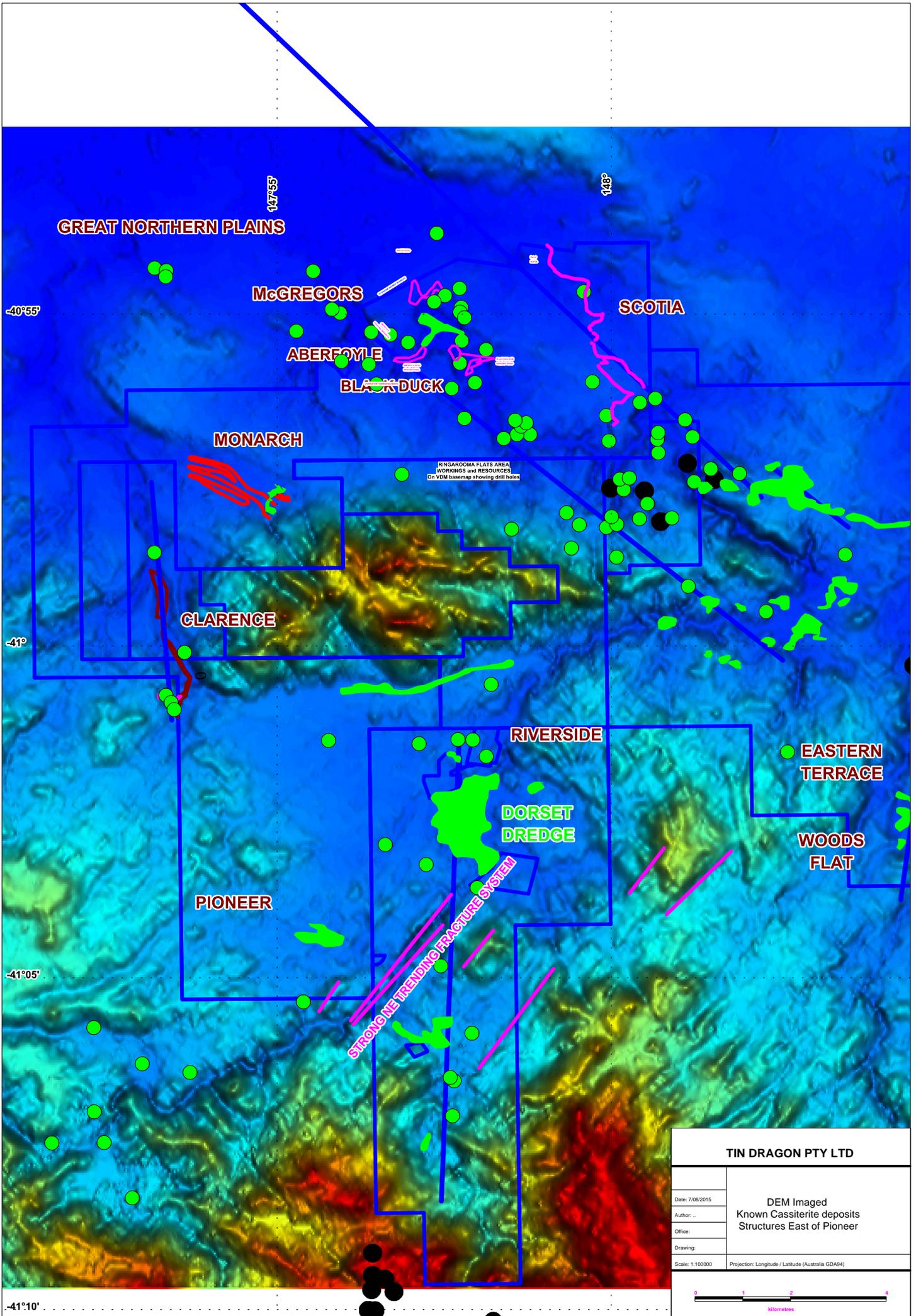
A failing of Yim's work is that he did not document the nature of the gravels in the studied deposits. He concentrated on the heavy mineral suite and failed to note the presence or absence of Mathinna bed pebbles/cobbles, their sorting and angularity and whether they were mineralised- this data is critical to understanding the provenance of the placer deposits especially where there are no proximal mapped Mathinna beds, which is the case at Endurance and Pioneer. I discuss this further under the sections on each deposit area.

Targeting with remote sensing

Given the likelihood that there are proximal basement sources of cassiterite for all of the major alluvial deposits, and given the general lack of outcrop in most of the areas, I have assessed various remote sensed datasets to ascertain if targets can be generated from them.

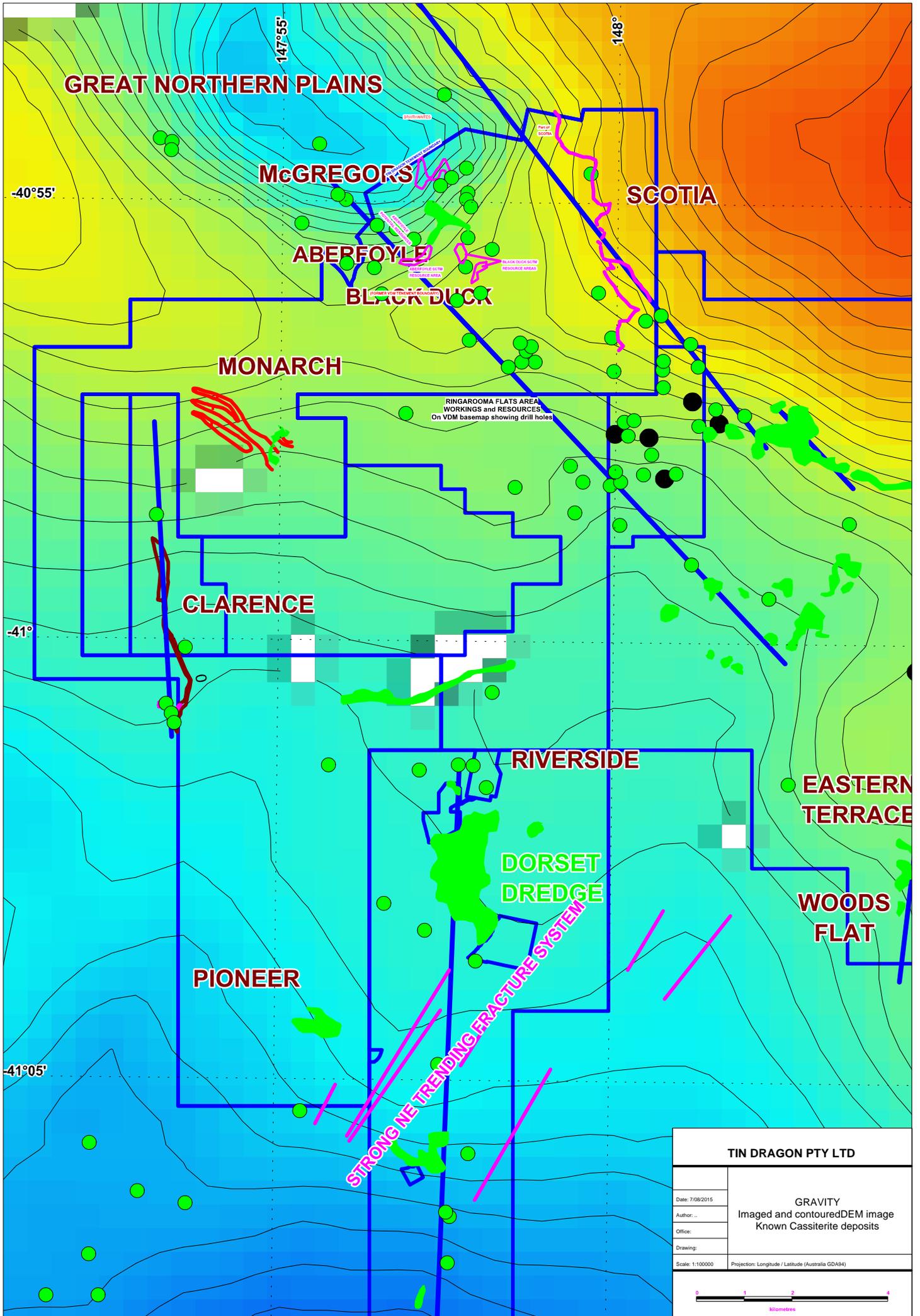
DEM

The DEM image derived from MRT survey datasets and downloaded from the GA GADDS website, Fig 6, shows prominent features like Mt Cameron, a young tectonic horst (as I have discussed in annual reports for other Tin Dragon tenements), and the current Ringarooma River valley. Other prominent NE trending topographic features are apparent, as illustrated.



TIN DRAGON PTY LTD	
Date: 7/08/2015	DEM Imaged Known Cassiterite deposits Structures East of Pioneer
Author: ...	
Office: ...	
Drawing: ...	
Scale: 1:100000	
Projection: Longitude / Latitude (Australia GDA84)	

FIG 6



TIN DRAGON PTY LTD	
Date: 7/08/2015	GRAVITY Imaged and contoured DEM image Known Cassiterite deposits
Author: ...	
Office: ...	
Drawing: ...	
Scale: 1:100000	Projection: Longitude / Latitude (Australia GDA94)
<p>0 1 2 4 kilometres</p>	

FIG 7

These features may be mineralised faults, now partly controlling the current channel of the Ringarooma River, and so are target areas as discussed in the Pioneer section below.

MAGNETICS

Various images of airborne magnetics datasets were studied but no features of interest such as granite phases, structures, geological contacts, or magnetite alteration associated with mineralisation were discernible.

GRAVITY

Ground gravity data was processed and contoured, and tin occurrences plotted, Fig 7.

North and east of Mt Cameron the known tin deposits be they alluvial (and assumed close to a primary source) or primary have a distinct tendency to occur in a corridor along a NW gravity gradient. This corridor is postulated to be a deep seated fault system controlling mineralisation. Within that corridor preserved granite cupolas and localising structures at Mathinna bed/granite contacts would be good target areas. Thus two target areas emerge; in the Ringarooma Flats area and south and west of Scotia. These targets are discussed more below.

RADIOMETRICS

Images of K, U, and Th channels were studied. The Mt Cameron massif has a strikingly anomalous response in each of these channels, compared to other granite suites, so it is presumably a granite phase separate from others in the region; Fig 3 illustrates the thorium channel. Other areas show little contrast useful at this stage for targeting.

Individual Deposit areas

Each of the main placer deposits is assessed here to target where their basement sources might occur. The larger the alluvial deposit, presumably the larger the proximal bedrock source was/can be expected to occur.

PIONEER

The Pioneer placer has been dated at Late Oligocene to Early Miocene, (Morrison 1980 quoted in Yim 1990). It thus predates by millions of years the current Ringarooma River valley alluvium, so the current nearby river will not have delivered the cassiterite from any source. Most authors consider Pioneer to be part of the ancient Wyniford lead, which would mean that the cassiterite source for Pioneer will be in the vicinity of the current Wyniford River somewhere. This would be a logical conclusion and a place to target were it not for Yim's trace element study which demonstrates that Pioneer has a separate source, and may have pegmatitic affinities. If this source is upstream in the paleodrainage within 2km of the existing placer deposits this would place a target area in the zone of NE trending fractures in granite visible on DEM, and which now partly control the channel of the current

Ringarooma River, Fig 6. The modern alluvium there could be concealing bedrock mineralisation.

However at Pioneer much of the pebble and cobble of the alluvium consists of Mathinna beds, yet no Mathinna beds are mapped for a radius of several km. Thus I postulate the source area for Pioneer was the Mathinna contact at the pre-existing now entirely eroded granite roof zone, say 1-4km east of Pioneer. If this is correct only the at-depth part of that system, now partly obscured by modern Ringarooma alluvium, would be prospective.

However I further suggest that originally Pioneer was much bigger and extended further east, and subsequently much of its Oligocene-Miocene alluvium has been stripped by the modern Ringarooma river and reworked alluvium and cassiterite was redeposited 3 to 4km away to the north at the former Dorset Dredge site. This would mean that a source for Pioneer is east of the current Ringarooma River and only an area east of that river is prospective. This area would be close to the very old Chinese worked Garibaldi workings, about which little is known and where no previous exploration has been reported.

ENDURANCE and CLIFTON

Yim quotes several lines of evidence, including the presence of course cassiterite, to conclude that Endurance is partly eluvial and close to source. Its trace element signature is the same as for other partly eluvial deposits fringing Mt Cameron, including Monarch and Ah Kaw, which he suggests have pegmatitic source signatures. In the Ah Kaw area there are reports of course topaz and course smokey euhedral quartz, which support a pegmatitic source. This source area is logically the very radiometrically distinctive Mt Cameron granite, Fig 3. It is likely that the apical parts of this granite with mineralised phases have been eroded during its tectonic uplift, providing alluvium to these structurally controlled deposits.

Unfortunately it is likely that these source zones are entirely eroded and no target basement areas remain, because of the considerable vertical uplift of Mt Cameron above the surrounding plain. Any remaining mineralisation would surely have been discovered by prospectors in the good rock exposures on Mt Cameron, so I believe that no bedrock targets of major dimension can be generated there.

One possibility however is that the Endurance "gutter" itself is a mineralised fracture system similar to the Taronga deposit. The gutter is strait and structurally controlled. Past sluicing to bedrock can be expected to have exposed such a system if it exists, so the target can be a valid model only if past miners did not recognize bedrock mineralisation and mistook it for cassiterite penetrating weathered bedrock cracks.

CLARENCE-HASTIES

The rather straight alluvial system on the west side of Mt Cameron suggests structural control similar to Endurance, so this area has potential for an underlying mineralised system of Taronga type.

MONARCH

Yim believed Monarch had characteristics of an eluvial deposit, which means that a bedrock source is very proximal. The Monarch "alluvials" are underlain by weathered granite basement against a NW trending contact with Mathinna Beds. The geological contact is regional in nature (5km in length) and appears to be intruded by a dyke of "granitoid". The array of Mathinna beds, a swarm of E-W jointing to the east and a 1km diameter circular feature visible on SPOT imagery, suggest the possibility of primary tin located at the head of the alluvial/reworked colluvial Monarch Fan, (see previous annual reports). No past exploration of such a target has previously been conducted.

However the alluvium at Monarch contains very rounded pebbles attesting to a long transport path and therefore a more distant cassiterite source. This apparent conflict can be resolved if Monarch has a composite origin, with some alluvium derived from afar, (from the east as I have postulated in previous annual reports for other tenements), but the bulk of the cassiterite is derived proximally.

SCOTIA

The sinuous pattern of the deep lead and its bifurcation into the Scotia lobe and the Lochaber lobe at the south, suggests to me that Scotia is a 2nd order paleo stream and not the major path of the ancient Ringarooma River as suggested by previous authors, especially Kinnane for Van Dieman Mines. This local stream, though probably Eocene in age, may have seen relatively little reworking, and because of the coarse contained cassiterite a very proximal source is indicated.

The source would commence just at the head of the old workings, where the Mathinna/granite contact is exposed, and within the gravity corridor discussed above. The source area would extend south to the current Ringarooma River where mineralisation if it exists is likely to be obscured by modern alluvium, and then extend down to the known quartz lodes and greisens south of Gladstone. A much bigger system than the known lodes and greisens at Gladstone may thus exist, unless the bulk of it has been eroded away.

RINGAROOMA FLATS (including MacGregors, Aberfoyle etc)

There is no production from basement mineralisation recorded in this area, nor are there any old basement workings recorded.

At Dry Gut, and Taylors Workings, fine grained tin is the norm, but there are local concentrations of coarse angular cassiterite often occurring as particles locked on quartz. A very local source is indicated [10_6111].

Yim's trace element studies suggest that mineralisation here will differ from that having a Mt Cameron source. The signatures are in keeping with vein/greisen deposits.

The area is close to the contact of Mathinna Beds and granite, as shown on the 1:25000 geology plan, suggesting that the areas of granite could have been only partially unroofed in recent geological time; this apical zone if mineralised could be a proximal source of most of the alluvial tin in the area.

The area thus represents a prime target for basement mineralisation, hosted in both granite and Mathinna Beds. The style of mineralisation, as elsewhere in the district, could be as greisen bodies, sheeted quartz veins and mineralised joints, and have been ignored or been unrecognized by prospectors.

6.0 SAPPHIRES

Introduction

[The following was largely derived from the pre-existing web site or the 2004 Prospectus of Van Dieman Mines (VDM), from Mineral Holdings Australia (MHAPL) reports such as 01_4616 [Kinnane, N.R. 2001. Report on Sapphire Bulk Testing Program. SEL 22/1999, NE Tasmania], and VDM reports such as 05_5163, 09_5928 and 10_6111 [Kinnane, N. 2003 Sapphire and Associated Gemstones Van Dieman Tin Project Areas NE Tasmania. Van Dieman Mines Pty Ltd.], and a honours thesis, [McGee BM , 2005, Characteristics and origin of the Weldborough sapphire, NE Tasmania. BSc Honours Thesis University of Tasmania.]

An unpublished petrographic report obtained from DDM files is attached in the Appendix of this report.

Sapphire (gem corundum) has been recorded from a number of localities throughout Tasmania, however it is only those locations in the north and north east that have sufficient size potential to become attractive for large scale mining exploitation. Sapphire was regularly reported as a component of the tin bearing alluvial gravels in north east Tasmania and was often recovered from tin shed concentrates at such operations as the Briseis, Pioneer, and Endurance Mines and from the Dorset dredging operations in the Ringarooma River.

Alluvial localities with known sapphire are shown on Fig 8:

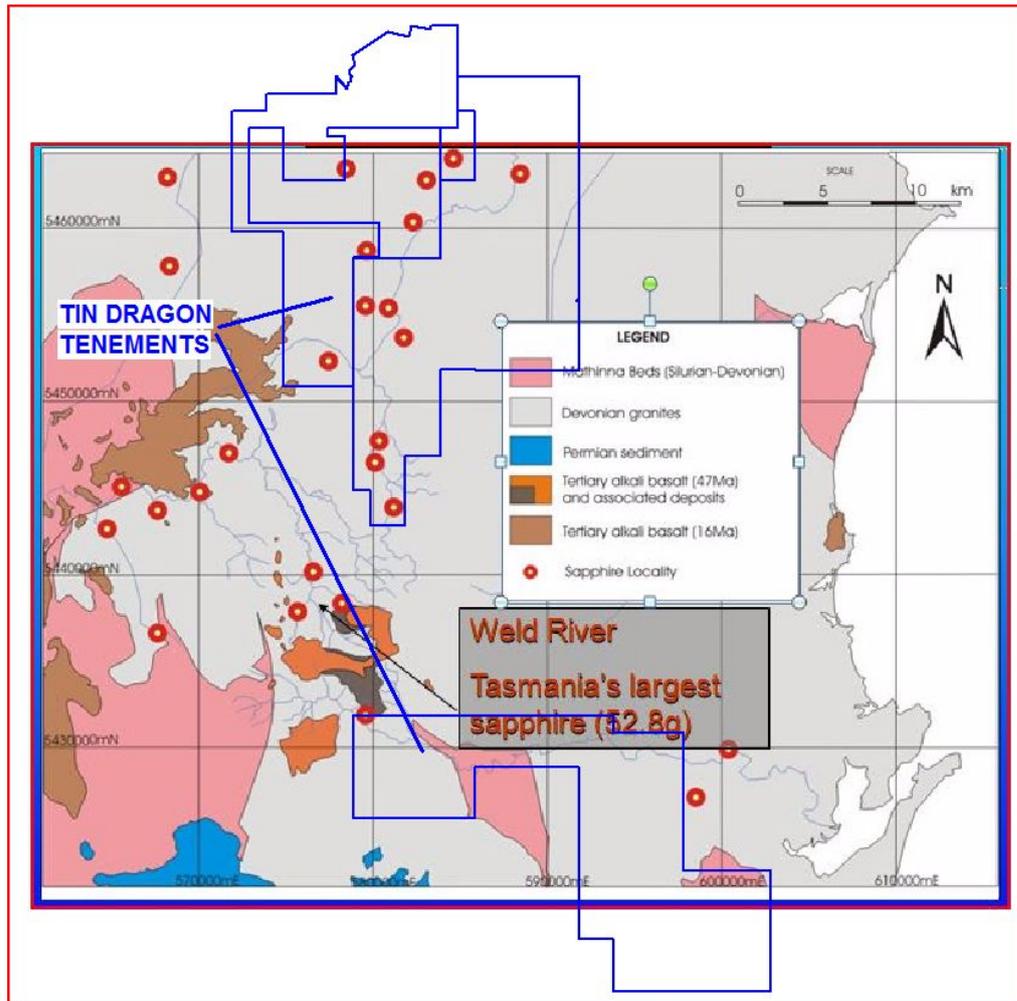


Fig 8 SAPPHERE LOCALITIES NE TASMANIA, after McGee 2005

McGee studied the age and ultimate bedrock source of the sapphire, focussing on the Weld River area. Dating of zircon inclusions in sapphire of $47 \pm 4\text{Ma}$ is the same age as the Weldborough Basalt confirming that the basalts, including explosive phases such as tuffs, ash flows and agglomerates, brought the sapphire to the surface. He concluded that Weldborough basalts are the source of all sapphire, spinel and zircon found in the Ringarooma, George and possibly the Boobyalla River catchments, yet he admits that there is no reason (he had no evidence that) the more common Miocene younger basalts did not also yield sapphires.

Sapphire size varies from 1mm through to pieces of more than 25mm. They have a dominant blue hue, pale to beautiful cornflower, exhibited by the 20% gem fraction of the sapphire concentrate. A small component also has a milky appearance like the Sri Lankan Gueda gems that heat treat to the finest blue.

The sapphire bearing stanniferous deposits of the Weld River are probably the best known and exploited. In addition to blue stones these streams contain green, brown, black, red and rarely yellow gems, and star sapphire is quite common particularly in Spinel and Black Creeks.

It is unlikely that any stand-alone sapphire deposits will be located, because average tin bearing alluvium seems to contain about 2g of sapphire/m³, of which around 20% seems to be of gem quality. According to VDM [Kinnane, 10_6111] sapphire is by far the second most significant valuable component of the heavy mineral fraction in alluvial tin deposits in NE Tasmania. Thus sapphire should, if recovered, significantly enhance the economic viability of future tin mines because it is a minor component in most of the known alluvial tin deposits.

According to GemSelect, in 2011 sapphire is the second best-selling coloured gem in the USA, after tourmaline.

History

Early tin miners first reported the presence of sapphire from many mining locations throughout the north east. None of those early reports were quantified and sapphire was not treated as a significant component of the alluvial deposits. Generally it was not of interest to miners and explorers.

Sapphire is a significant component of the tin shed tailings at the Pioneer, Endurance and Dorset Dredge Mines. Previous operators report that sapphire of fine blue colour was regularly recovered from the primary and secondary jig beds during clean-up.

There have been a number of significant stones recovered by fossickers. A 264 carat stone was recovered in the Weld River [Catalogue of Minerals of Tasmania, MRT]. In 1933, a 900 carat stone was reported to have been discovered in mining detritus at the Weld River.

MHAPL in 1999 obtained a Special Exploration Licence SEL22/1999 over a vast area of the north east corner of the State, (2693 km²). In 2004 Van Dieman Mines (VDM) acquired this tenement from Mineral Holdings Australia (MHA), as part of a package of 13 exploration tenements, all located in NE Tasmania. At the time of the acquisition the tenement area had been reduced to 1211km²; in 2006, VDM further reduced the tenement to 271km² across three prospective areas, one of which partly covered this Tin Dragon Tenement.

Reconnaissance exploration by MHAPL has confirmed that gem quality sapphire is a component of many of the tin bearing alluvial leads, and along with gold and other heavy minerals comprises a potential economic component previously overlooked in most test programs.

A statistical review was carried by MHAPL on the size range of sapphires in public and private collections. All parcels of sapphire recovered by MHAPL in its test programs since 2001, or observed in the collections of local miners and prospectors appeared to contain between 20 to 30% blue gem material. Large stones, greater than 6mm, were rarely observed although historically such stones were regularly reported to have been recovered during alluvial tin sluice box and jig plant clean-up. Such stones are in the collection of the Derby Museum, and other private collections in the region. The absence of such stones in

most parcels was postulated by MHAPL to be due to their removal by the owners as specimens or for cutting.

In addition to the sizing analysis, MHAPL arranged to have some small parcels of very poor quality blue sapphire/corundum heat-treated, by an Australian gem cutter. Heat treatment proved effective in that most untreated parcels containing between 20 and 30% blue gem, appear to improve to between 30 and 40% blue gem.

VDM's exploration of sapphires included some bulk testing, acquisition from prospectors of parcels of sapphires, and they sought alliances with gemstone cutters and marketers.

In 2007 VDM and Columbia Gem House (CGH) formed a 50:50 joint-venture company called "V Columbia" to market all gemstones recovered from VDM's Tasmanian operations. Columbia Gem House, Inc. is a vertically-integrated gemstone mining, cutting and marketing company and is a charter member of the American Gem Trade Association. Columbia Gem House, Inc. is apparently best known as the world's largest supplier of brand-name exotic gemstones. Sample rough and finished gemstones, including blue sapphires and black spinel, were displayed at two major USA gem shows in 2007 and 2008. The product name "Tasmin Blue" was being used before VDM went into liquidation.

In 2007 VDM arranged for a heat treatment of parcels of sapphires taken from outside Tin Dragon's current tenements. They reported that heat treatment was successful and sapphires did not become very dark, which can commonly happen elsewhere. This is apparently especially true of basaltic sapphire which often has a high rutile content, and heating can render the material too dark for gem use.

The benefits of heat treatment of gemstones are many. Key benefits are that the removal of impurities through heating generally causes the stone to exhibit a more consistent and transparent colour, which is aesthetically pleasing to a potential buyer, and that a heated stone is generally easier to cut.

Relevant bulk testing in Tin Dragon tenements is reviewed below.

VDM's exploration expenditure for sapphires in Special Exploration Licence SEL22/1999 was reported to MRT to be \$826,000.

Sapphire Exploration in or near the Tenement

DORSET DREDGE

The Ringarooma River is considered to be a significant sapphire source. Stones observed by Kinnane from VDM varied from -1 mm to +10 mm in size, most are rounded a few angular. Hues are predominantly of fine blue but there is a larger green, partly blue-green, brown, black and star component. Kinnane reports that John Volker the ex-manager of the Dorset Dredge possessed a small parcel of fine blue stones obtained by him when the dredge was working the Dorset Flats. Volker advised that coarse and fine sapphire was regularly

observed on the primary and secondary jig beds during clean-up. Heavy “ragging” of the jigs to enable high grade tin concentrate production would not have been conducive to the recovery of the much lighter sapphire and that much of the sapphire would have been washed from the bed into tailings.

PIONEER

According to Kinnane sapphire from the Pioneer Mine (he believed sourced from the Wyniford Lead) is abundant in the older Tertiary stanniferous gravels but less common in the overlying Quaternary deposits.

A parcel of stone recovered from the Pioneer Tin Shed yielded some excellent blue stones.

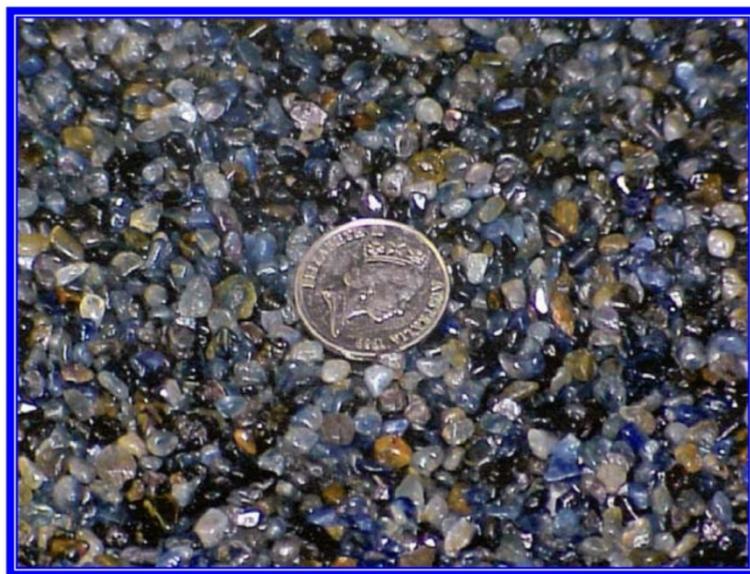


Fig 9 PIONEER TIN SHED TAILINGS

A large parcel of 815 grams of sapphire recovered by MHAPL during the re-treatment of cassiterite rich tailings at the Pioneer Tin Shed contained about 20% gem quality sapphire principally fine blue with a small proportion of fancy sapphire; green, yellow and clear. It was noted that this material represented only the fine sapphire / corundum fraction being the jig underflow and secondary jig underflow products sourced during the AMDEX operations in the mid 1970s. The seller advised that this parcel represented only a small fraction of the sapphire present in the tailings and was material easily hand-picked from the tin concentrates to improve cassiterite concentrate grades.

The parcel was acid washed (HF for 2 hours) to remove iron staining and unlike other parcels of sapphire from NE Tasmania collected by MHAPL, because it did not represent "Run of Mine" material, no screen analysis was undertaken. This Pioneer parcel then comprised a significant proportion of gems from the district sent for cutting. 1,200 pieces of gem blue were selected totalling 385 carats and a further 50 pieces of "fancy" colour totalling 23 carats selected for cutting.

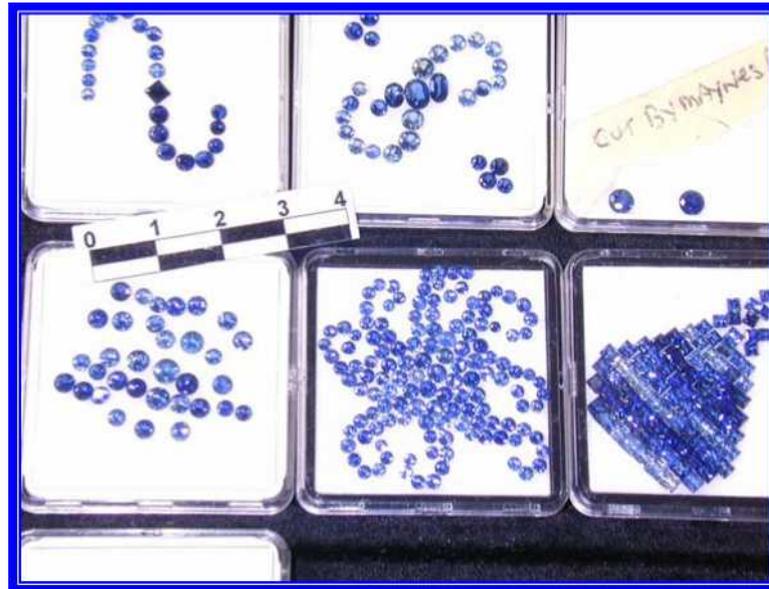


Fig 10 CUT PRODUCTS (Bottom Left Boxes)

Regarding the presence of sapphire at Pioneer it is interesting that geologist Revel Munro, who used to work at the Pioneer mine in the early 1980s, stated in a personal conversation with me around one year ago that no sapphire was recovered at the Pioneer mine itself and the sapphires in the tin shed were derived from parcels of ore from elsewhere in the district.

It is possible that Revel Munro's contentions are incorrect because abundant sapphires were definitely recovered/reported nearby to the north at the Dorset Dredge operation, and nearby to the south in the Wyniford River system workings.

ENDURANCE

Sapphire was recovered from old jig ragging at the Endurance Mine and from Endurance Mine tin shed tailings and thus sapphire is considered to be a significant component of the heavy mineral fraction at that deposit.

MONARCH

Reports from individuals who worked at the mine during the 1970s were that sapphire was regularly observed on jig beds during clean-up.

Reconnaissance sampling by MHAPL found sapphires present in mine tailings.

The presence of sapphire at Monarch is unusual because the area is apparently not connected to any stream system that sheds from a basaltic source.

In 2001 MHAPL conducted pitting and bulk sampling. Samples were processed through a small mobile alluvial treatment plant comprising feed bin, trommel, two-cell Dorr-Olivor type jig and sluice. The pits were excavated in the "B" Lens section of the resource not far from previous reconnaissance sample locations. No sapphire was observed in either the jig

bed or jig underflow concentrates and tin results were in line with those reported from previous drilling. Reports from individuals who worked at the mine during the 1970's were that sapphire was regularly observed on jig beds during clean-up, stones of +10 mm being collected. The consensus of opinion was that heavy ragging with steel shot in the production jigs aimed at securing very high Sn values in the concentrate would have resulted in heavy sapphire loss to tails.



Fig 11 TREATING BULK SAMPLES AT MONARCH

SCOTIA

In 2010 VDM collected a 200t bulk sample taken from near surface gravels in the southern end of the Scotia system. It demonstrated that the remnants of near surface Ringarooma River terrace gravels on the Scotia mine lease carry significant tin and consistent accessory gold mineralisation. Occasional very small topaz, sapphire and zircon stones were recovered as jig screen oversize.

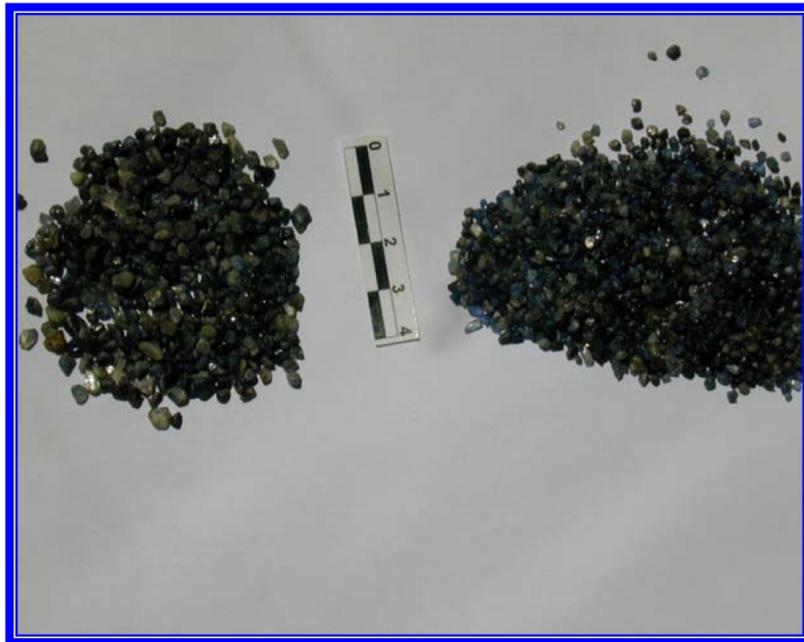
It is important to note that the sample was not from the deeper Tertiary age wash which constitutes the known published resources. Despite the VDM hype of fabulous sapphires to be recovered from the Scotia plant, there are no records of sapphires in this deeper wash. This is mainly because it was never explored for, but it is also possible that there simply is no sapphire in the resource alluvium. On theoretical grounds one can make a case that Scotia

carries no sapphire because the Tertiary lead and its hinterland is well away from any known source basalts, be they Eocene or Miocene.

NEW DORSET

During mid 2001 MHAPL collected and treated a 1m³ sample of tailings from the old Dorset Dredge Tin Shed site on the Great Northern Plains. A total of 350.3g of sapphire in the 1-5mm size range was recovered.

A CGH (2008) report on material processed from these tailings: “sapphire material is small ... (a) parcel of 123 pieces for 17 grams will cut to 2-3mm in size. These stones weigh from 0.06ct to 0.13ct after cutting. This means this group is about as small as we want to go in usable size.”



DORSET DREDGE TIN SHED SAPPHIRE PARCEL (Part)

Fig 12

RINGAROOMA RIVER FLATS

Great Northern Plains Prospects (Source 10_6111)

Reconnaissance sampling by MHAPL of the scattered old workings gave highly variable results, and reflects the overall lower heavy mineral contents of these distal alluvial deposits. There were however some significant sapphire grades returned from the Aberfoyle and Delta workings. Gold is a common component in all the basal gravels in this area; visible gold was observed in all samples from Taylor’s workings.

VDM carried out bulk testing of the stanniferous alluvials fringing the Great Northern Plain and recovered sapphire from on top of the jig beds and from jig underflow concentrates. 20% of this material is of light blue coloration and in the 1 mm to 7 mm size range. Results are considered qualitative only. Ragging of jig beds would indicate sapphire losses to tailings.

Wanex

Four pits were excavated at this prospect in an area previously drill by Wanex. Sites were selected so as to coincide with old drill locations where high cassiterite grades had been reported. Several holes failed to reach basement (+7m) and in fact did not intersect the profile described in drilling. Thick zones of bouldery dolerite were intersected in three of the pits. One pit intersected a sandy Tertiary alluvial horizon that yielded 24 sapphires, the largest a 7mm fine blue stone. This result is significant in that the site is distal from source rocks.

Taylors

These old worked areas lie just west of the abandoned Dorset Dredge Tin Shed site at the edge of the Great Northern Plain. The workings expose up to 8m of Tertiary alluvium consisting of sands, gravely sands, sandy clays and a basal gravely granite based sand resting on weathered granite. There is some evidence to suggest at least part of the deposit has been reworked by marine wave action. Also coalified wood and pyrite are common. Without exception all MHAPL samples yielded sapphire and while predominantly in the smaller size ranges most exhibited distinct blue coloration. One ruby was reported. Visible gold was observed in all samples.

Aberfoyle

MHAPL reconnaissance sampling yielded the highest sapphire grade of 91.5g/m³ in the area. It is significant in that it was obtained from a remnant of un-worked basal alluvium. Four pits were excavated at Aberfoyle East Workings, three on the western side of the access track at the old "Shell Face", an area from which marine shell fossils have been recorded, the fourth sample from the western side of the track in an area of shallow basement. Only three of the pits were sampled, all yielded cassiterite, sapphire, zircon, rutile and ilmenite, but no gold was observed. Pit ABE4, sample A125 yielded 4.9g of sapphire (3.3 g/m³), predominantly blue in colour in 2mm to 3mm size ranges, sample A122 and 124 yielded around 2mm sapphires.



Fig 13 VDM bulk sampling at Taylors Workings

Resources

Kinnane (2003) was bold enough to quote resource grades for sapphires for several of the deposits, and these are quoted verbatim below. The quoted sapphire grades are not based on definitive drill based sampling but merely on his guesstimates, perhaps wishful. This is particularly the case for Scotia where there is no reported evidence for the presence of sapphire.

MONARCH:

Proven Ore Reserve - A, B & E Lens (At 200 gm/BCM grade cut-off)

556,751 bank cubic metres (BCM) at an average grade of 1.220 kg/BCM of 70% Sn concentrate (679 tonnes of 70% Sn concentrate)

and an estimated

2.0gm/BCM sapphire (20% gem quality)

19 grams/BCM of Zircon as ZrO₂.

48 grams/BCM of Rutile and Ilmenite as TiO₂

Probable Ore Reserve - D Lens

(At 100 gm/BCM grade cut-off)

59,100 bank cubic metres (BCM) at an average grade of 139 grams/BCM of 70% Sn concentrate (8.2 tonnes of 70% Sn concentrate)

and an estimated

2.0gm/BCM sapphire (20% gem quality)

19 grams/BCM of Zircon as ZrO₂.

48 grams/BCM of Rutile and Ilmenite as TiO₂

SCOTIA PROJECT:

Probable Ore Reserve -(100 gm/BCM cut-off)

5,334,338 BCM containing an average grade of

1.300.0gm/BCM of SnO₂ at 70% Sn (6,948 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

250 grams/BCM of Zircon and Rutile

0.015gm/BCM of Gold

1.50gm/BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 3.0: 1 Inferred Mineral Resource -(100gm /BCM cut-off)

5,336,750 BCM containing an average grade of

1.300.0gm/BCM of SnO₂ at 70% Sn (6,938 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

250 grams/BCM of Zircon and Rutile

0.015gm/BCM of Gold

1.50gm/BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 3.0: 1

Recent data to hand has quoted gold grades in the Lochaber Lead of 2oz/y³ thus estimated grades given above may be conservative.

ENDURANCE PROJECT:

Proven Ore Reserve -(100 gm/BCM cut-off)

1,637,395 BCM containing an average grade of 983.72 gm/BCM of SnO₂ at 70% Sn (1,611 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

200 grams/BCM of Zircon and Rutile

0.020gm/BCM of Gold

1.50gm/BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 4.6:1 Indicated Mineral Resource -(100 gm/BCM cut-off)

2,342,134 BCM containing an average grade of 978.72gm/BCM of SnO₂ at 70% Sn (2,343 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

200 grams/BCM of Zircon and Rutile

0.020 gm/BCM of Gold

1.50gm/BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 3.6: 1

PIONEER PROJECT:

Proven Ore Reserve -(200 gm/BCM cut-off)

3,186,040 BCM containing an average grade of

1,164.82 gm/BCM of SnO₂ at 70% Sn

(3,711 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

200gm/BCM of Zircon and Rutile

0.020gm/BCM of Gold

1.50gm/BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 6.2:1

Inferred Mineral Resource -(200 gm / BCM cut-off)

3,500,000 BCM containing an average grade of 1,000.00 gm/BCM of SnO₂ at 70% Sn (3,500 tonnes of SnO₂ concentrate).

and an estimated

2.0gm/BCM sapphire (20% gem quality)

200gm/BCM of Zircon and Rutile

0.020gm/BCM of Gold

1.50gm/ BCM of Tantalite

Stripping ratio of Overburden to Ore is quoted at 4.3: 1

Previous sapphire assessment works indicate grades average in excess of 2.0 gm/BCM.

7. OTHER MINERALS

Apart from tin and sapphires the Tin Dragon tenements have prospectivity for gold, tantalum, monazite, zircon, ilmenite, rutile, clay, ion-adsorption rare-earth deposits, and other gemstones such as topaz and peridot.

Gold

Gold is a common component of the heavy mineral suite in many of the alluvial deposits in the Gladstone- Mt Cameron region and often gold was recovered as a minor though significant by-product of mining.

Gold being heavy is unlikely to have travelled far, so it is probable that the bedrock sources are close to the alluvial deposits. There are known small quartz vein hosted gold deposits in a cluster south of Gladstone, hosted in Mathinna beds. Some contain cassiterite.

Presumably there is granite at shallow depths below. It is possible that similar veins in similar rocks are the sources of the gold in the widespread alluvials. These rocks are now eroded away or not exposed or possibly are exposed but unrecognized.

The potential for significant basement stand-alone gold mineralisation is low, because intense prospecting in this area would likely already have discovered it.

Below are notes on known gold in the more important alluvial deposits in or near the Tenement:

Dorset Dredge recovered sufficient gold from its operation to meet part of its annual cost. VDM claimed that the gold grade averaged around 30mg/m³. It is not known if the recovery process, having been optimised for cassiterite, was able to efficiently recover gold.

Pioneer, Endurance and Monarch. Gold is reported to occur here in the concentrates, though I can find no supportive literature. I have seen no gold reported in the production records, so I assume the gold content here is negligible.

In this respect the resources of gold in these tin deposits calculated by VDM, albeit they are JORC compliant, are probably unreliable.

Scotia. In 2010 VDM collected a 200t bulk sample taken from near surface gravels in the southern end of the Scotia system. It demonstrated that the remnants of near surface Quaternary terrace gravels on the Scotia mine lease carry accessory gold mineralisation. Nye reports in 1932 [UR1932a_017-44] that in the upper layers of the Lochaber lead there is 2oz/cu yd of gold. This may also be a terrace type, though Lochaber alluvium, probably from deeper horizons is Eocene in age.

It is important to note that the gold bearing samples were not from the deeper Eocene age wash which constitutes the bulk of known published resources. It seems there are no records of gold in this deeper wash, so as is the case for Pioneer Endurance and Monarch the resource estimates by VDM of gold in the Scotia deposit are probably unreliable.

New Dorset. The actual production 1964 to 1971 from the dredge at the New Dorset site was 762t of tin concentrate assaying 75% Sn and 24.8kg gold.

Ringarooma Flats. Reconnaissance sampling by MHAPL found gold at Taylors, MacGregors and Canary workings.

Tantalite/Columbite

There is no known occurrence of tantalite/columbite in the district. As a very minor component of concentrates there is chemical analytical evidence of the presence of tantalite–columbite series minerals. Kinnane, in GNP Report 11 -2003, (in VDM digital files), reports on confusing studies of concentrates from drilling programs by Santos and MHAPL at the Aberfoyle Hill area (in [02_4587]). This found evidence that at least some of the Ta + Nb occurs within cassiterite, and that Ta+Nb: Sn was 1:170.

Kinnane (2003) was bold enough to quote resource grades not only for sapphires but for tantalum, as quoted at the end of Section 6 of this report.

Monazite and Xenotime

Kinnane VDM [10_6111] reports that the tin shed tailings from Pioneer, Endurance and the Dorset Dredge all contain appreciable quantities of these minerals. They report to the magnetic fraction of the heavy mineral concentrate and comprise between 0.2 to 5% by weight of the concentrate.

Morrison [10_6109] states that at Pioneer, monazite comprised 6% of the heavy mineral assemblage and was considered a nuisance rather than a credit. He also states that monazite may be as much as 20% of the Scotia concentrates.

There probably are considerable amounts of monazite in all the alluvial tin deposits but rarely has it been quantified and rarely produced as a by-product. The Endurance Mine sold 34t in 1934 but the mode of production is unknown, [95-3703]. It has been noted as abundant in concentrates in mines in the areas east and south-east of Mt Cameron. The Mt Cameron granite probably has a high monazite content judging by its high thorium response in recent airborne surveys by MRT, see Fig 3.

The rare earth content of monazites was studied by MHAPL by submitting to AMDEL Laboratory a sluiced concentrate from an unstated site in the Great Northern Plains, [99-4334]. The monazite contained 24.4%Ce, 1.84%Y, 6.59%Th, and 0.39%U.

The value of monazite depends on its precise light and heavy rare earth and thorium composition, which varies between deposits, but it can be the main ore mineral for several rare earth elements, which are normally traded as oxide powders.

There is much scope for evaluating the monazite tenor, composition etc for each of the major tin placer deposits because of its potential commercial impact.

Zircon

VDM [10_6111] reported that 3 types of zircon have been recognized in the alluvial deposits including:

Fine zircon grains, -5 mm in size, commonly observed in the cassiterite concentrates at all mine locations, considered to have been derived mainly from granitic rocks. Like ilmenite and monazite it has not been produced as a by-product nor sought in exploration programs, though given its high value at certain times in the commodity cycle, it has clear economic importance in the future.

Two separate generations of coarse zircon are observed at widespread locations in the north east, derived from the Tertiary basaltic units. The material varies in size from 1mm to +10mm. Colour varies from pale red to bright foxy red. A proportion of the larger stones make attractive faceted gems, but are apparently quite rare.

The larger size zircon is present in Ruby Flat, Branxholm and Weld River areas, but moving northwards into the Tin Dragon tenement areas attrition has much reduced the grain size and it is rare to see stones any larger than 2mm.

Very little quantitative data in relation to zircon content of the alluvials was reported in previous mining operations. In the 1960s Hellyer Mining conducted some zircon analysis of concentrates derived from drilling of the Great Northern Plain. Bulk sampling by MHAPL reported zircon grades of between 1 to 50g/m³. The nature of the treatment flowsheet used by MHAPL was not conducive to zircon recovery thus higher zircon contents would be expected if improved treatment circuitry was utilized.

Ilmenite and Rutile

Yim 1990 deals at some length on the origin of these minerals in the placer deposits. They can be derived both from basalts and from granite, and the trace element contents have promise to ascertain some of the past depositional history and provenance of those placers.

Ilmenite is the most abundant of the titanium bearing minerals. Field observations indicate that ilmenite content substantially exceeds that of rutile. In past mining operations much of the ilmenite was traditionally lost to tailings and no effort has been made to quantify content in exploration programs, (except for one program by VDM in the Fosters Deposit in the Great Northern Plains, outside TD tenements).

None appears to have been produced as a by-product in the district though there is ample justification for this for the future, because content can be significant. For example AMDEX reported in 1981 [81-1528] that at Pioneer concentrate from the basal alluvium contains 58.9% cassiterite, 28.1% ilmenite, 6.5% monazite, 3.4% zircon, 1.6% topaz, 1.5% 'others'.

Rutile occurs in most of the alluvial deposits and reports to the cassiterite concentrates as fine reddish to black grains rarely more than 1 mm in size.

The source of the rutile is considered to be the acid igneous rocks and to a lesser extent the Tertiary basalts and associated pyroclastics. Where the alluvials are exclusively derived from Mathinna Bed sediments rutile contents are very low.

Test work by MHAPL [02-4567] at the Aberfoyle area included confusing analysis for TiO₂, however no effort was made to report these results as either ilmenite or rutile. Grades of TiO₂ were reported to lie between 4 and 140g/m³. Test plant losses would indicate higher grades are likely to be present.

Clay

There are large deposits of kaolinite clays associated with both alluvial and eluvial (weathered granite) tin workings in NE Tasmania. Clay deposits within Tin Dragon tenements are as follows:

Endurance

Around 53 000t of clay was mined in conjunction with tin at the Endurance mine at South Mt Cameron from 1945 to 1962, and was used exclusively by the paper industry as a filler clay.

The clay forms layers in granite-derived Tertiary sediments of sand and gravel, certain horizons of which are tin bearing. The clay was mined in conjunction with the tin. Extensive laboratory tests were made in 1962 by the Department of Mines, and as a result a pilot plant was designed to separate the clay from the associated quartz grit. This process was quite successful, and clay derived from this source was used satisfactorily for some time. The operation ceased because the reserves at this location were largely exhausted.

Garibaldi

Granite saprolite is exposed in old workings on the northern flank of Garibaldi Hill. Samples from exposed faces taken by BCC in 1970 showed good yields but sub-marginal brightness. In 1975 hand drilling of the most promising exposures showed a falling-off of colour and yield within two or three metres of the surface. A composite sample from three bores had a minus 12micron brightness of 76.1 which improved to 78.5 in the minus 5micron fraction. These results were not sufficiently encouraging to justify drilling.

Aberfoyle-Dry Gut area

Just outside Tin Dragon's tenement at the Dry Gut Prospect, drilling by Mineral Holdings Australia Pty Ltd [VDM 03-4852] confirmed a clay deposit over an area of 0.25km², from 0.75 to +10.5m thick averaging 6m, under a sandy overburden from 1 to 2m thick. According to VDM there is an inferred geological resource of 1.5Mm³ or 2.8 million tonnes of mixed clays (assuming an SG factor of 1.86).

The clay has a range of colours (brown, grey, blue, green, white, black and red) and textures (waxy, plastic and sticky), The more homogeneous clays commonly overlie and are derived from dolerite bedrock apart from the southern section of variable clays which overlie a mixed bedrock of granite and metasediment.

Identification of the clays reveals that the northern group are mainly smectite whereas in the south kaolinite is more common although impure. Industrial testing by Australian Bulk Minerals showed that

the clays would not be suitable as a pelletising agent. Percentage Water Adsorption (PWA) values were in the range 100- 300 where 600- 800 would be required to rival Wyoming bentonite. Tests by Sud-Chemie A.G. of Germany confirm the low adsorption and swelling volume features and infer that the clay is a low swelling smectite such as beidellite and /or nontronite rather than montmorillonite as was suggested by a CSIRO test which gave Fe, Mg and Ca rather than Na in the chemistry. Beidellite and nontronite are widely found in soils derived from the weathering of basic rocks such as the Jurassic dolerite in this case. Fuller's Earth in Europe comes from this source and provides encouragement that higher adsorptive clays may still be found at Aberfoyle Hill. The kaolinite clays are too impure to be considered as an exploration target. Further technical studies of the clays in the deposit are required to determine the full range of properties leading to the identification of market possibilities.

The clays were tested for rare earths, see below.

Nearby, and to the south of the Ringarooma River, in the TD tenement, a bentonite deposit is shown in MRT records but no reports have yet been located. It seems that this general area is prospective.

Rare Earth deposits of Ion-Adsorption Types

Duncan for MHAPL in [02_4657] reports on testing for this style of rare earth deposit, known at Chinese producing mines.

A kaolinite clay from Monarch and 4 montmorillinitic clays from the area east of Aberfoyle Hill, just outside TD tenement, were analysed as below, obtaining well below the 0.2 to 2% required for commercial deposits of this nature:-

	<u>ELEMENT</u> <u>ppm</u>	<u>SAMPLE</u> <u>NUMBER</u>	<u>SAMPLE</u> <u>NUMBER</u>	<u>SAMPLE</u> <u>NUMBER</u>	<u>SAMPLE</u> <u>NUMBER</u>	<u>SAMPLE</u> <u>NUMBER</u>
		<u>027</u>	<u>038</u>	<u>050</u>	<u>068</u>	<u>M108</u>
<u>LOCATION</u>						<u>Monarch</u>
<u>DESCRIPTION</u>		<u>M/Morill</u>	<u>M/Morill</u>	<u>M/Morill</u>	<u>Kaolinite</u>	<u>Smectite</u>
	<u>Ce</u>	<u>22.00</u>	<u>89.00</u>	<u>29.50</u>	<u>62.00</u>	<u>91.00</u>
	<u>Dy</u>	<u>2.20</u>	<u>7.00</u>	<u>6.00</u>	<u>2.90</u>	<u>4.00</u>
	<u>Er</u>	<u>1.25</u>	<u>3.30</u>	<u>3.60</u>	<u>1.50</u>	<u>2.00</u>
	<u>Eu</u>	<u>0.64</u>	<u>2.50</u>	<u>1.20</u>	<u>0.95</u>	<u>0.47</u>
	<u>Gd</u>	<u>1.65</u>	<u>6.50</u>	<u>3.80</u>	<u>2.90</u>	<u>4.40</u>
	<u>Ho</u>	<u>0.43</u>	<u>1.25</u>	<u>1.25</u>	<u>0.49</u>	<u>0.68</u>
	<u>La</u>	<u>7.50</u>	<u>25.00</u>	<u>7.00</u>	<u>17.50</u>	<u>24.50</u>
	<u>Lu</u>	<u>0.22</u>	<u>0.44</u>	<u>0.64</u>	<u>0.26</u>	<u>0.37</u>
	<u>Nd</u>	<u>10.50</u>	<u>44.50</u>	<u>15.00</u>	<u>25.50</u>	<u>38.00</u>
	<u>Pr</u>	<u>2.60</u>	<u>10.50</u>	<u>3.50</u>	<u>6.50</u>	<u>10.00</u>
	<u>Sm</u>	<u>2.30</u>	<u>10.00</u>	<u>4.40</u>	<u>5.00</u>	<u>8.50</u>
	<u>Tb</u>	<u>0.29</u>	<u>1.10</u>	<u>0.78</u>	<u>0.44</u>	<u>0.71</u>
	<u>Tm</u>	<u>0.20</u>	<u>0.50</u>	<u>0.65</u>	<u>0.25</u>	<u>0.40</u>
	<u>Yb</u>	<u>1.40</u>	<u>3.40</u>	<u>4.50</u>	<u>1.70</u>	<u>2.60</u>
<u>TOTAL</u>		<u>53.18</u>	<u>204.99</u>	<u>81.82</u>	<u>127.89</u>	<u>187.63</u>

Topaz

As stated before AMDEX reported in 1981 [81-1528] that at Pioneer concentrate from the basal alluvium contains 58.9% cassiterite, 28.1% ilmenite, 6.5% monazite, 3.4% zircon, 1.6% topaz, 1.5% 'others'.

According to Kinnane [VDM 10_6111], the Endurance and Monarch Deposits contain abundant fine (sand sizes) to coarse (up to fist sizes), rounded to sub-rounded to crystalline topaz varying in colour from clear through to green and blue. He claims where present in any quantity it causes extreme difficulty in clean-up of tin concentrates.

Gem quality topaz, some of considerable size and excellent blue colour is known outside the Tenement on the north side of Mt Cameron, for example in Sexton Ck, 2.6km west of Gladstone, Twelvetrees (1916).

Peridot (Olivine)

According to VDM gem quality green olivine is abundant in the Younger Tertiary Basalts particularly in the vicinity of the Briseis Mine at Derby. Grains of bright apple green olivine have been reported from most of the alluvial deposits.

There is a low expectation that the deposits in TD tenements will yield any significant quantity nor quality of peridot.

Other Gems

According to Kinnane, other gem mineral reported to occur in the project area include spinel, gemmy quartz varieties, gem quality chrysoberyl, garnet, beryl and tourmaline. Gem quartz, beryl and tourmaline are all probably derived from quartz and quartz - pegmatite veins and the chrysoberyl from the Older Tertiary basalts. The origin of the garnet is uncertain but it may be related to zones of contact metamorphism in the Mathinna Beds.

Spinel is common but usually not prized as a gem. Along with cassiterite, sapphire and zircon, spinel is one of the most abundant accessory heavy minerals. The bulk of the spinel is of the pleonaste/hercynite variety however there have been a number of reports of the presence of the green gahnite species. The colour is usually steely grey to black and sizes vary from small angular to rounded fragments to very large +25 mm crystal pieces. Localities such as Ruby Flat, Main Creek, Black Creek and the Upper Weld River that are proximal to the Older Basalt source rocks all contain very large and crystalline spinel.

Spinel is invariably accompanied by sapphire and zircon and thus is a valuable indicator as to the possible presence of sapphire in the alluvial profile.

8.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

There are substantial known alluvial tin resources and substantial potential for primary tin and tungsten to be discovered close to all major placer deposits.

In all cases the placer tin deposits have had insufficient evaluation by previous explorers for potentially very valuable easily recoverable by-products, especially sapphire, and other heavy minerals especially gold, monazite ilmenite, and rutile.

9.0 EXPENDITURE

Expenditures have been reported via MRT Quarterly Returns.

10.0 REFERENCES

A full reference list has not been attempted. Relevant references are embedded in the text of this report.

APPENDIX

Petrographic studies

From unpublished VDM files

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Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

To:	Neil Thomas		
From:	John Towie		
Date:	13 July 1999	Total No. Pages:	7
Subject:	Sapphire Plots		

The cumulative number vs carats per stone plots all show a distinct gradient change at 0.1 carats and a cut-off at 0.3 carats. This is too extreme to be natural. The effect of this on the number vs grade plot is to decrease the gradient as the number of recovered sapphires increases (ie. there is an artificial cut-off).

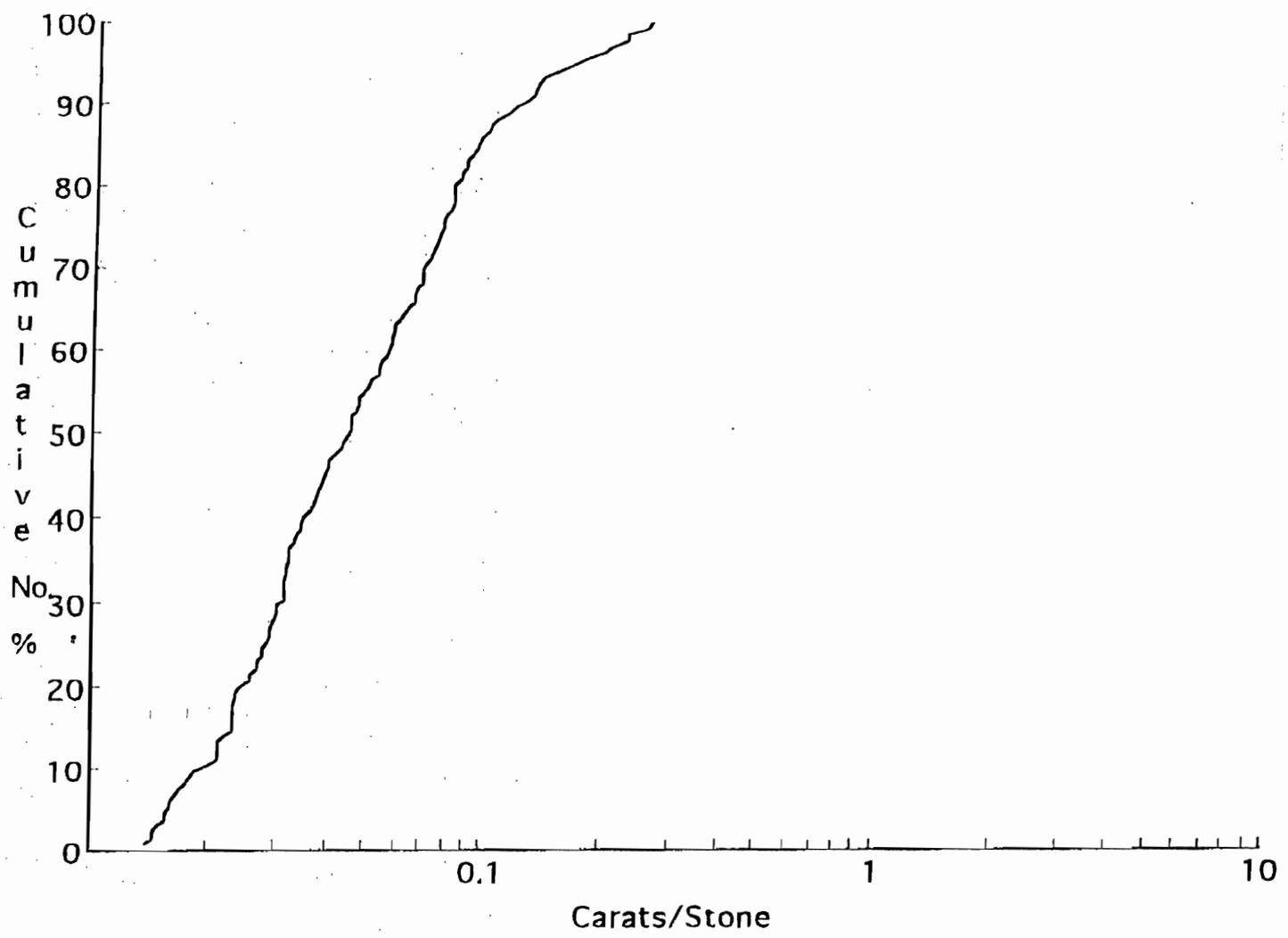
Extrapolation of the straight line section for all three number vs grade plots indicates that if 1000 sapphires are recovered from the natural population then the grade of the tailings was in the order of 600 to 1000 carats per tonne.

There is a lot of statistical manipulation that can be done with this data. I would like to email it to you or whoever will be analysing it. I require an email address and the format you use (ie. Claris, Excel, Lotus).

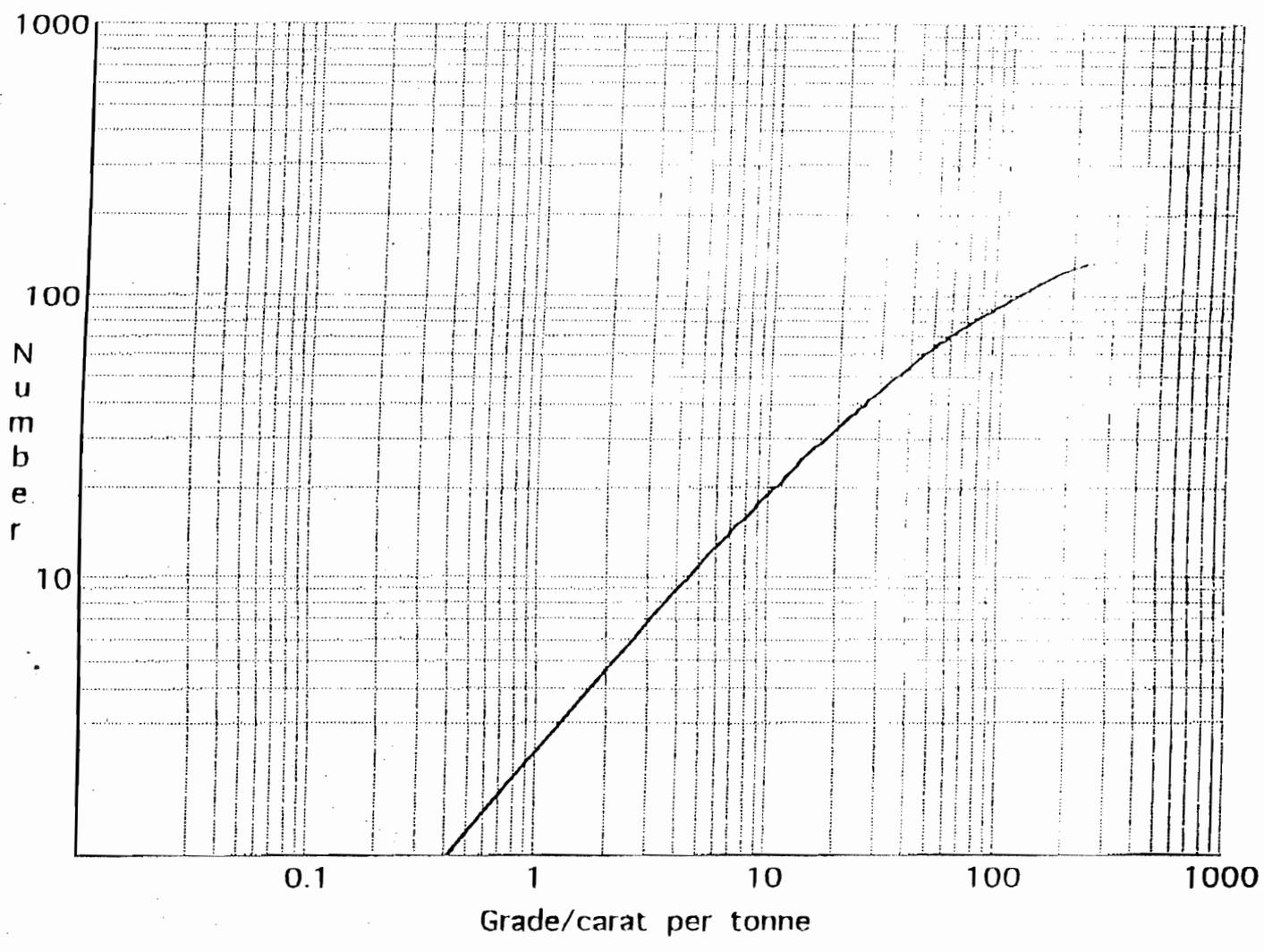
There has been no written confirmation from UWA, but John Hillyer phoned to say the six red grains scanned, were zircon. I am both shocked and amazed as several of the submitted grains had distinctive corundum properties as opposed to zircon. They will be re-examined further, in my own time. I recommend you take the red zircon seriously, as any large volume of this material could be marketed as "Tasmanian Ruby." Zircon has a higher RI than corundum and does not cleave, making it an excellent gem.

Regards.

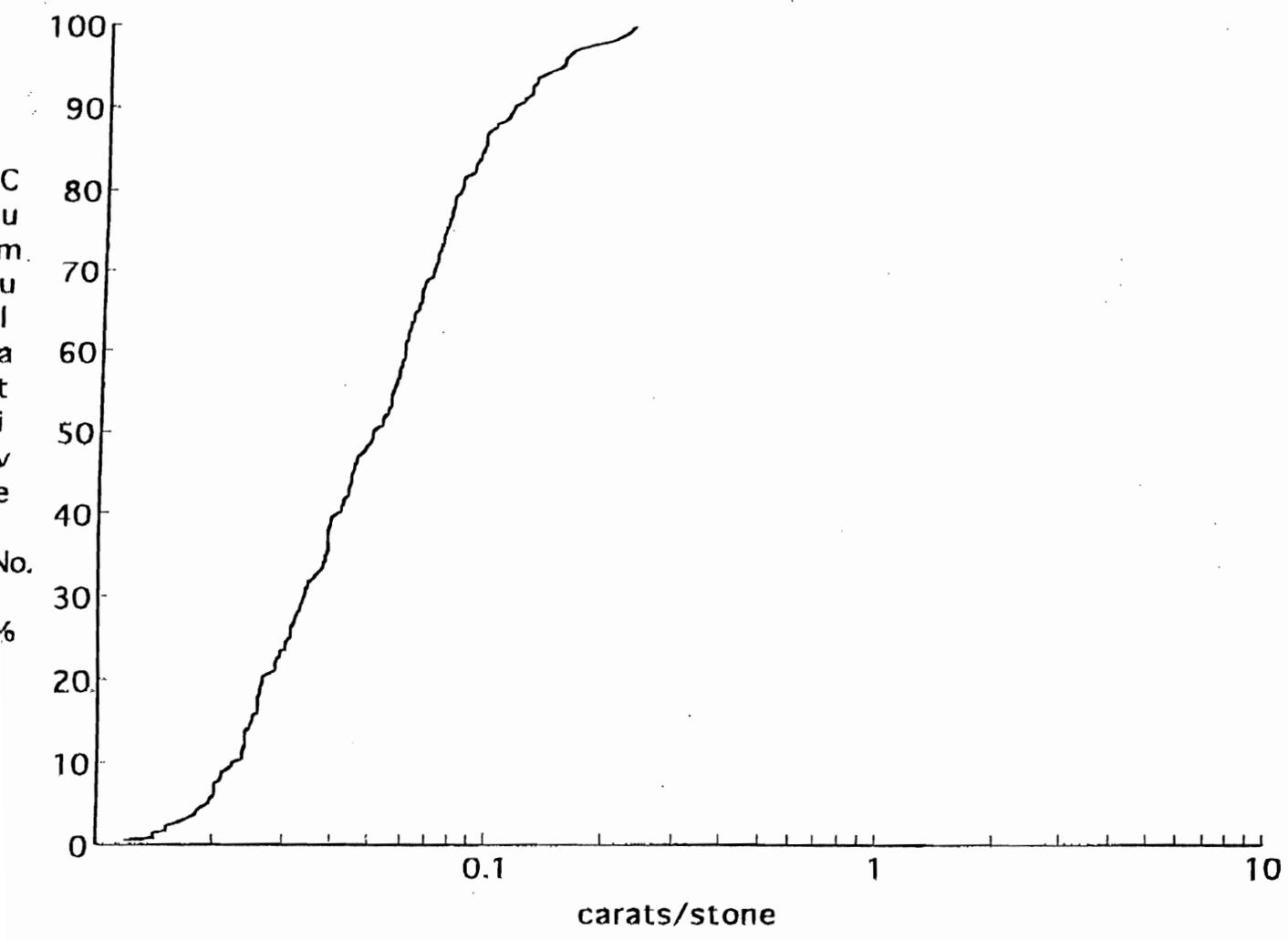
Dorset Dredge



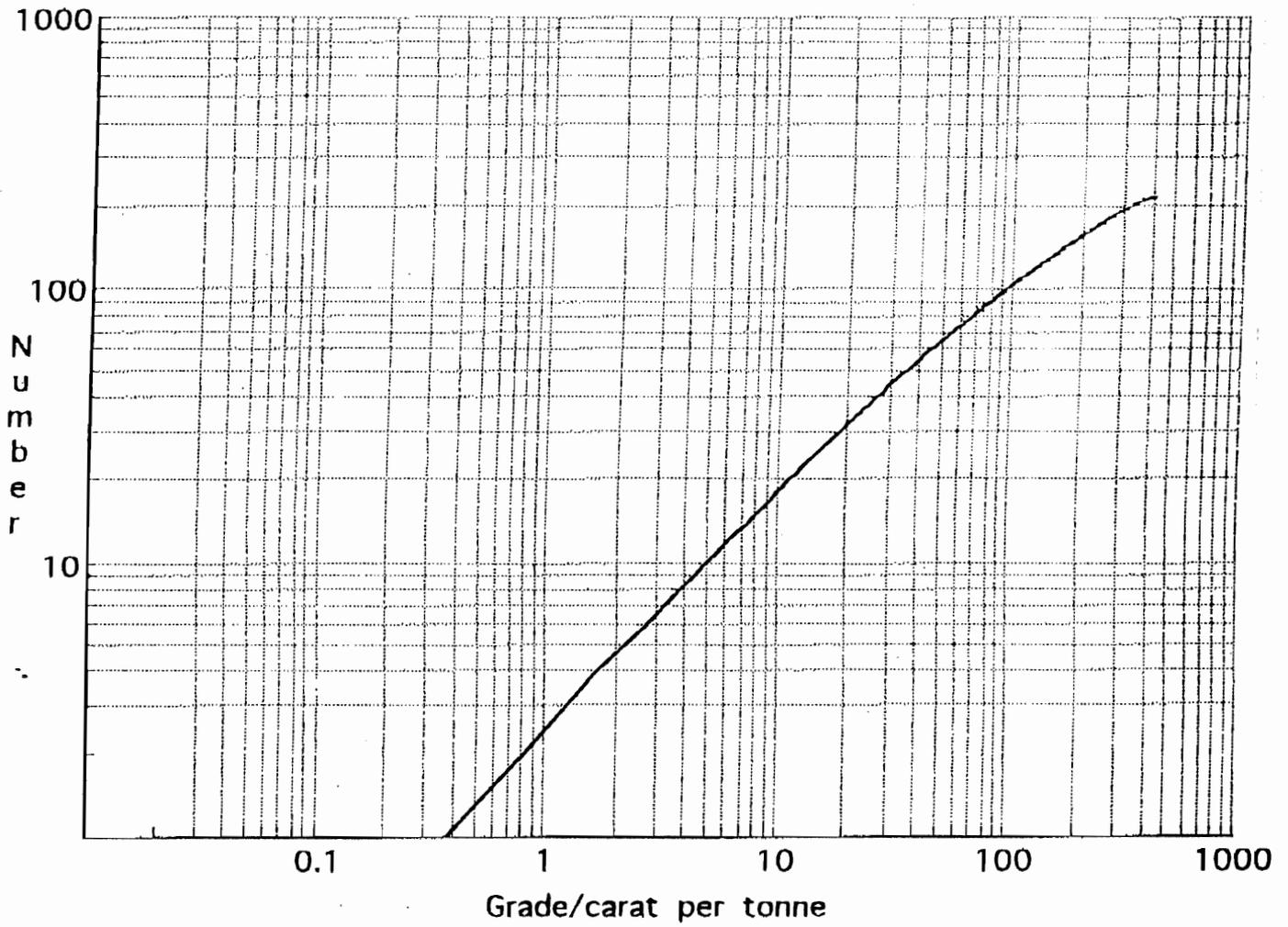
Dorset Dredge



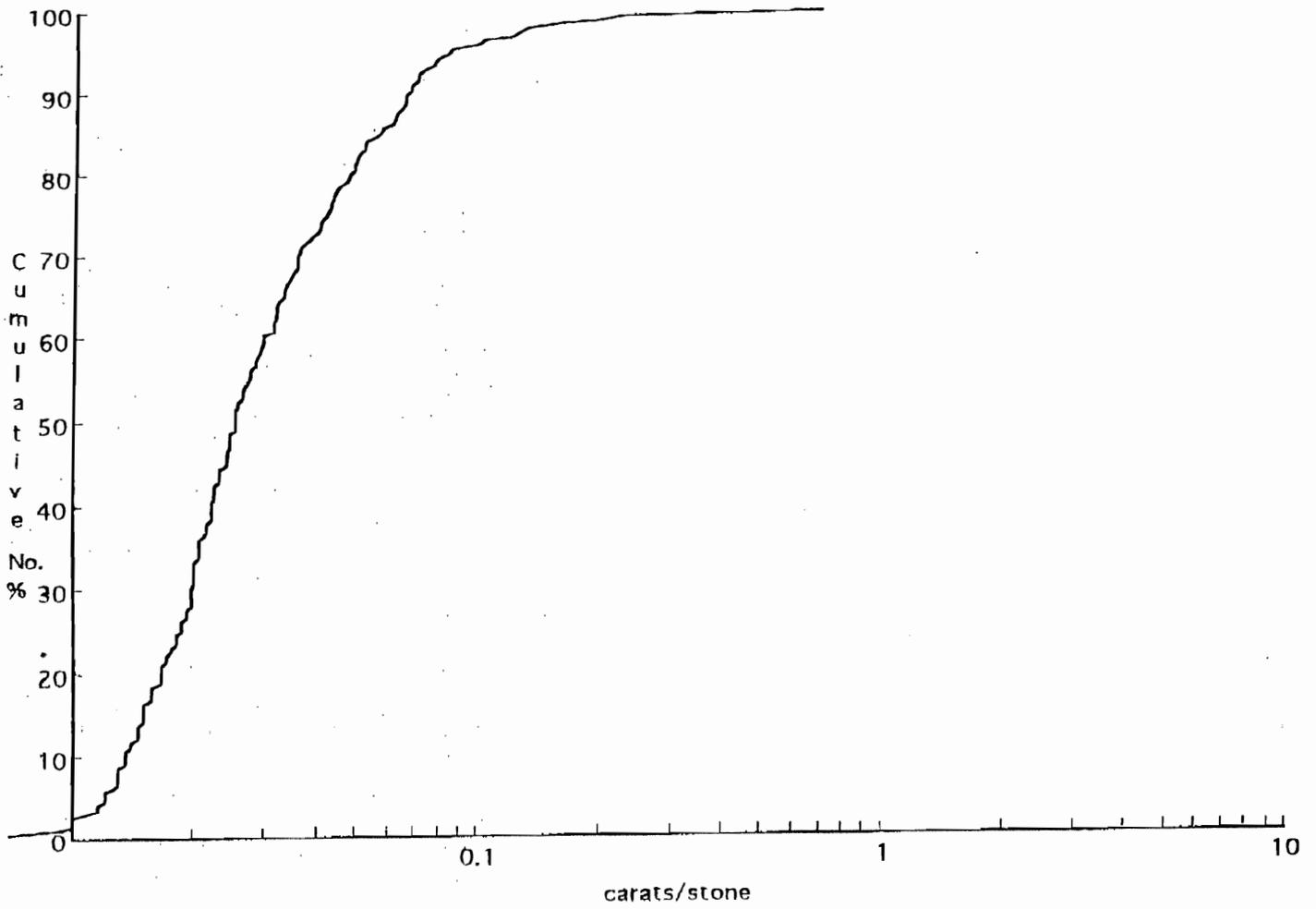
Endurance



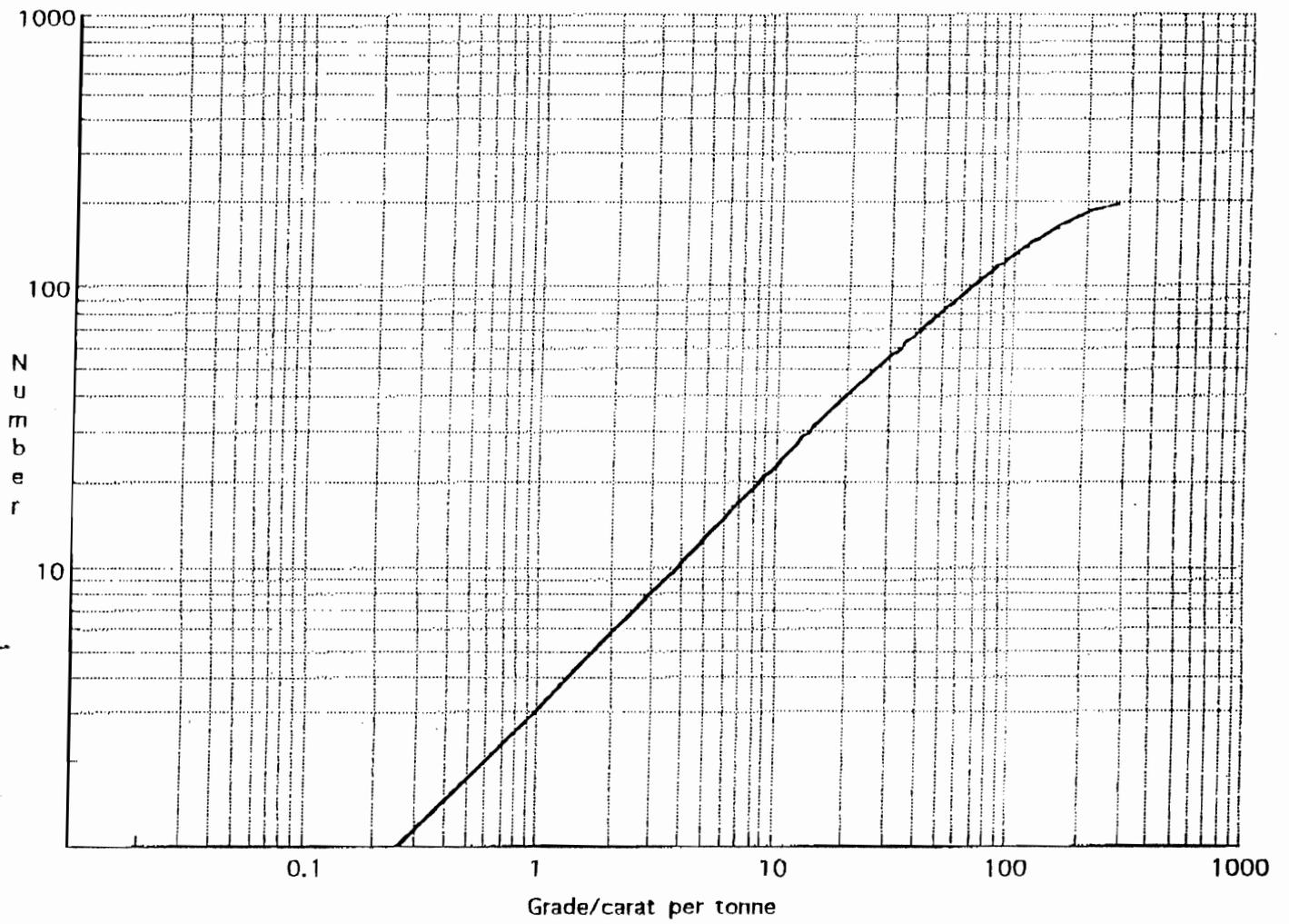
Endurance

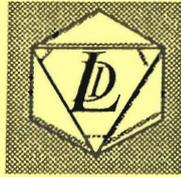


Pioneer



Pioneer





Laboratory Report

for

Mineral Holdings Aust. Pty Ltd

May 1999

Samples

A,B,C,D,E,F 31-50/52-88

Composite 1 & 2

Dorset Dredge Tailings

INDEPENDENT DIAMOND LABORATORIES PTY LTD

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UNIT 2, 50 Westchester Road
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Job No: 287

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MR NEIL M THOMAS
 GUEST
 WENTWORTH HOTE SYDNEY



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Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

To:	Neil Thomas		
From:	John Towie		
Date:	30/6/99	Total No. Pages:	18
Subject:			

Lee has spent almost a week observing the "Endurance" concentrate. It will take the two of us two more days to complete the +1mm (at observation charge rate). If you would like us to produce a partial result we can do estimates from 1/2 observation of the -1+0.8mm fraction, which has been done.

In the next few months, Ultrsort will be re-commissioning the 121 X-ray sorter next door to us. We can have all the concentrates run through in minutes. If they are re-commissioning the charge will be minimal.

Attached is one of many grade plots done for alluvial diamonds. I see no reason why the method should not apply to sapphire and ruby. Assuming the +4mm gems have been removed, we should be able to extrapolate the grade by weighing the -4+1mm sapphires, rubies and plotting the results as a cumulative log-normal plot, which should approximate a straight line. This would involve about 5hrs "observing" time, 1hr of of my time unless you would prefer to analyse the data "in-house". I am forwarding a copy of the paper by mail.

I have conferred with the Ultrsort people about Xray or optical sorting of sapphires. They have investigated the concept for an Indian group who never followed up. In theory the Xray sorter (designed for diamonds) should pick out sapphires. Optical sorters will work but are slower, also, if diamonds are present they will not be picked out.

Regards

John Towie

1

17 PAGES
 ENCS. RETAINED AT COLLINS ST, OFFICE ✓

ical structures influencing diamond distribution, such as different kimberlite facies in pipes, or channels in alluvial deposits. The unit volume of the samples should be large enough to detect on average at least one stone per sample. If stone densities are high (several tens of stones per m^3) then the unit volume can be increased to allow detection of the correlation between adjoining samples. Before starting the systematic sampling programme, orientation pitting will reveal the presence of diamonds and general characteristics such as stone size and stone occurrence density. If sampling density is expressed as the ratio between total sampling volume and total volume of ore, then values of between 1 : 500 and 1 : 15,000 will be necessary to prove reserves up to the "measured (or indicated resources)" status, for sedimentary deposits with densities of commercial-sized stones varying from 0.1 to 100 stones per m^3 . In primary deposits, where economic grades correspond to stone densities of 10 to 1000 stones per m^3 , the sampling density ratio to prove reserves usually varies from 1 : 10,000 to 1 : 80,000.

In kimberlites and lamproites the development grid should be along a regular square pattern. Sampling in primary deposits should detect and be representative of the different facies present. For a discussion of the various facies that can occur in primary diamond deposits, the reader should refer to Nixon (1995). In crater facies, where near-horizontal layers of epiclastic sediments or volcanic tuffs dominate, samples will need to be split up with depth and treated separately, to determine grade variations from layer to layer. Coarse-grained tuff layers reflect higher energies during deposition from the air at the time of the volcanic explosion. Coarse-grained epiclastic sediments reflect the winnowing of the loose tuffs in the crater lake, with the larger and denser particles settling in the bottom gravels. Coarse-grained layers can therefore be expected to have larger stones and higher grades. In kimberlite or lamproite/diatreme facies, grades are likely to be more variable in the horizontal plane, than with depth. Differences in grade can be correlated with different vents, or with a concentric pattern of facies differentiation.

Marshall and Baxter-Brown (1995) discuss the geological controls on grade distribution in alluvial deposits. In alluvial or beach deposits, grid spacing should allow for anisotropy. Grade continuity will be better parallel to the transport direction. The grid should be close enough to pick up former river channels. In an

alluvial environment, the anisotropy can be defined by the length to width ratio of a deposit, developed between rockbars. The sample spacing along lines perpendicular to the river channel should be at most half the palaeochannel width (which is often, but not always, similar to the width of the present river channel).

2.1. Examples — primary deposits

The Orapa deposit in Botswana consists at the surface of an oval basin, approximately 760 m by 530 m, filled with kimberlitic sediments up to a depth of 90 to 285 m, and underlain by diatreme facies kimberlite. The evaluation of ore reserves was done by drilling to assess the continuity of the orebody at depth and by pitting along a 76 m grid to assess the diamond content (Allen, 1981). Pits were sunk to a depth of 12, 24 or 36 m. Samples were split in 1.5 m sections and treated in a heavy media pilot plant to determine grade variations between the different layers of kimberlite sediments. To obtain a sufficient number of diamonds for value estimation, additional pits were sunk on a 38 m grid to a depth of 30.5 m.

The Jwaneng kimberlite in Botswana is covered by 60 m of Kalahari sands. Development sampling was with 380 mm diameter drillholes along a 50 m grid to a depth of 200 m. Samples were taken in 6 m sections. Unit samples were only 0.68 m^3 , sufficient to recover several stones per sample, as the Jwaneng deposit is very rich (1.3–1.6 carats per tonne). The drilling results were confirmed with six pits of 3 by 3 m to a depth of 165 m (Charwick, 1983).

Development sampling of the Argyle lamproite in Australia was done with 16 m^3 samples dug along a 100 m grid. In the higher grade parts, reserves were developed with 200 mm drillholes along a 50 m grid. Samples in the drillholes were taken in 20 m sections. The drillhole unit samples were 0.63 m^3 , sufficient to recover several tens of stones, as the Argyle deposit has a high grade (about 5 carats per tonne) and a small average stone size. The grades were further confirmed with six pits of 2 by 2.4 m to depths of 43 to 64 m (Atkinson, 1989).

The Ellendale lamproites in Australia were evaluated in steps. Initially some 200 tonne samples were dug by excavator to verify the presence of diamonds. Where positive, a detailed sampling grid was laid out, with

one of 17
held in office

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To:	Neil Thomas		
From:	John Towie		
Date:	9/6/99	Total No. Pages:	2
Subject:	Comment on Results to date.		

1. **Indicator Minerals**

Picroilmenite - Two sets of probe data have been returned. Sample S2 picro has MgO up to 5.81% wt. and Cr₂O₃ up to 0.11% wt. Sample DD1 picro had MgO up to 7.95% wt. but Cr₂O₃ was below detection. Both of these results are worth follow-up for kimberlite.

2. **General Background Mineralogy**

The abundance of pleonaste, picotite, corundum, pyroxene and general background heavy minerals are very similar to the alluvial diamond fields of New South Wales. The paleo gravels are well worth bulk sampling for macrodiamonds.

3. **Previous Exploration**

There are unconfirmed reports that a previous barrage sampling program in Tasmania returned diamonds (I am following up this report). Had the the exploration company returned picroilmenite they most certainly have followed this up.

Regards,

HEAVY MINERAL DATA

Sample No: **Dorset Dredge tailings**

Job No: 287

Date Started: 10/5/99
 Processing Weights
 Initial: kg
 +2mm: kg
 After Tabling: kg
 After TBE: g

Positive (Economic Minerals)
 Negative
 Positive (Other)

Ø/mm	Fractions Analysed(x), Observed only(o), Scanned only(s)						
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
Table							
HL	x	x	x	x	x	x	x
Mag				x	x	x	

Significant Minerals Vol% of Concentrate

	Sieve/mm								
	2.36	2	1.18	0.6*	0.425	0.3	0.15	0.075	<0.075
Cassiterite					T	T	T		
Ilmenite					5	20	50	T	
Magnetite						T	1	T	0.5
Pleonaste	100	99	90	3?	30	15	15	10	
Rutile					1	1	5	40	30
Sapphire		2							
Topaz		T	5	75	60	55	30		
Zircon				20	1	1	5	50	70
Weight of Concentrate/g	22	55.6	101	58.5	75.3	79.9	176	38.5	1

Mineral	Size/mm	Grade	Description
Pleonaste	>0.6<1.180		Appears to have been removed.

Other Minerals (Volume% after Heavy Liquid)

Almandine	O	Orthopyroxene	T	Pleonaste	A	Apatite	
Andradite		Clinopyroxene	T	Magnetite		Monazite	
Grossular	F	Amphibole	F	Leucosene	F	Phosphate	
Spessartine	F	Biotite	T	Gahnite	O	Florencite	F
		Prehnite		Limonite		Rock Fragments	
Andalusite		Corundum	O	Pyrite(pseudo)			
Kyanite		Hematite		Pyrite		Zircon	C
Sillimanite		Ilmenite	C	Barite		Titanite	
Staurolite		Rutile	S	Anhydrite		Topaz	P
Epidote		Anatase	T			Cassiterite	S
Tourmaline	T	Brookite		Magnesite			

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T f-5grains

Mineralogist/Observer LG/MES/NJT

Date Completed: 18/5/99



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

34838

DIAMOND INDICATOR DATA

Sample No: **Dorset Dredge tailings**

Job No: 287

Date Started: 10/5/99
 Processing Weights SEE ATTACHED
 Initial: 0.67 kg
 +2mm: kg
 After Tabling: kg
 After TBE: 393 g incl. +0.3mm

Positive

Negative

Positive (Other)

Ø/mm	Fractions Analysed(x), Observed only(o), Scanned only(s)						
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
Table							
HL	x	x	x	x	x	x	x
Mag				x	x	x	

Kimberlite, Lamproite Indicators

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Morphology
Diamond										
Chrome Diopside										
Chromite										
Phlogopite										
Picroilmenite				1	2	3			5-10	Prob. Kimb.
Pyrope										
Diopside						3			<2	Poss. Lamp.

Detailed Descriptions

Mineral	Size/mm	Description
Picroilmenite		Anhedral, Blocky and rounded or angular shards, All have rounded abrasion pitted surfaces, Conchoidal fracture.
Diopside		Anhedral, One with saw tooth ends, Angular, Two contain <1% Cr2O3, Probably Lamprophyric eg. Melilitite
Pleonaste		Kimberlitic morphology ie. Source is probably lamprophyre.
Gahnite	<0.5mm	Subhedral to Irregular, Slight abrasion rounding, 2-8km from source.
Sapphire	26+1mm 0.385g 1@0.055g	50% are grey star sapphire, Several are pale yellow-green and one is white, Remainder are blue.

Other Minerals (Volume% after Heavy Liquid-HL)

Almandine	O	Orthopyroxene	T	Pleonaste	A	Apatite	
Andradite		Clinopyroxene	T	Magnetite		Monazite	
Grossular	F	Amphibole	F	Leucoxene	F	Phosphate	
Spessartine	F	Biotite	T	Gahnite	O	Florencite	F
		Prehnite		Limonite		Rock Fragments	
Andalusite		Corundum	O	Pyrite(pseudo)			
Kyanite		Hematite		Pyrite		Zircon	C
Sillimanite		Ilmenite	C	Barite		Titanite	
Staurolite		Rutile	S	Anhydrite		Topaz	P
Epidote		Anatase	T			Cassiterite	S
Tourmaline	T	Brookite		Magnesite			

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: LG/MES/NJT

Date Completed: 18/5/99



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

34865

UWA, Centre for Microscopy
and Microanalysis

Sample Description Mineral Ox no	Comp. 1 cmt SP 4	Sample Description Mineral Ox no	Comp. 1 micro Gp.A IL 3
TiO2	0.00	TiO2	54.60
Al2O3	20.52	Al2O3	0.00
Cr2O3	51.28	Cr2O3	0.00
V2O3	0.00	V2O3	0.00
FeO	14.47	Nb2O5	0.00
MnO	0.00	FeO	39.14
MgO	12.73	MnO	0.50
ZnO	0.00	MgO	6.64
NiO	0.00	CaO	0.00
		ZnO	0.00
		NiO	0.00
Oxide total	99.00	Oxide total	100.88
Fe2O3*	0.00	Fe2O3*	1.06
FeO*	14.47	FeO*	38.19
Total*	99.00	Total*	100.99
Ti	0.000	Ti	0.981
Al	0.755	Al	0.000
Cr	1.265	Cr	0.000
Fe3+	0.000	Fe3+	0.019
V	0.000	V	0.000
Fe2+	0.378	Nb	0.000
Mn	0.000	Fe2+	0.763
Mg	0.592	Mn	0.010
Zn	0.000	Mg	0.236
Ni	0.000	Ca	0.000
		Zn	0.000
		Ni	0.000
Cation total	2.990	Cation total	2.010
Mg No	61.05	Mg No	23.65
Ulvospinel	0.00	XTiO3	98.10
Spinel	37.37	Hematite	1.90
Chromite	62.63	Ilmenite	74.14
Magnetite	0.00	Pyrophanite	0.98
100Cr/(Cr+Al)	62.6	Geikielite	22.97
100Fe/(Fe+Mg)	38.9		

Sample Description Mineral Ox no	DD1 picro #1			DD1 picro #2			DD1 picro #3			DD1 picro #4			DD1 picro #5			Sample Description Mineral Ox no	DD1 gahnite #1			DD1 gahnite #2			DD1 gahnite #3			DD1 gahnite #4			DD1 gahnite #5					
	IL	3	3	IL	3	3	IL	3	3	IL	3	3	IL	3	3		IL	3	3	IL	3	3	IL	3	3	IL	3	3	IL	3	3			
TiO2	54.27	50.90	53.32	54.15	53.41	54.15	53.41	53.32	54.15	53.41	54.15	53.41	53.32	54.15	53.41	53.32	54.15	53.41	53.32	54.15	53.41	53.32	54.15	53.41	53.32	54.15	53.41	53.32	54.15	53.41	53.32	54.15		
Al2O3	0.31	0.30	0.00	0.00	0.27	0.00	0.27	0.00	0.00	0.27	0.00	0.27	0.00	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Cr2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
V2O3	0.48	0.00	0.00	0.35	0.40	0.00	0.35	0.40	0.00	0.40	0.00	0.35	0.40	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Nb2O5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
FeO	36.73	42.92	39.83	38.27	37.77	38.27	37.77	39.83	38.27	37.77	38.27	37.77	39.83	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27	37.77	38.27		
MnO	0.29	0.38	0.27	0.49	0.58	0.49	0.58	0.27	0.49	0.58	0.49	0.58	0.27	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58	0.49	0.58			
MgO	7.95	4.97	5.82	6.76	7.39	6.76	7.39	5.82	6.76	7.39	6.76	7.39	5.82	6.76	7.39	6.76	7.39	5.82	6.76	7.39	6.76	7.39	6.76	7.39	6.76	7.39	6.76	7.39	6.76	7.39	6.76	7.39		
CaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
ZnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
NiO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Oxide total	100.03	99.47	99.24	100.02	99.82	100.02	99.82	99.24	100.02	99.82	100.02	99.82	99.24	100.02	99.82	100.02	99.82	99.24	100.02	99.82	100.02	99.82	100.02	99.82	99.24	100.02	99.82	100.02	99.82	100.02	99.82	100.02		
Fe2O3*	0.46	2.56	1.12	0.72	1.04	0.72	1.04	1.12	0.72	1.04	0.72	1.04	1.12	0.72	1.04	0.72	1.04	1.12	0.72	1.04	0.72	1.04	0.72	1.04	1.12	0.72	1.04	0.72	1.04	0.72	1.04	0.72		
FeO*	36.31	40.62	38.82	37.62	36.83	37.62	36.83	38.82	37.62	36.83	37.62	36.83	38.82	37.62	36.83	37.62	36.83	38.82	37.62	36.83	37.62	36.83	37.62	36.83	38.82	37.62	36.83	37.62	36.83	37.62	36.83	37.62	36.83	
Total*	100.08	99.73	99.35	100.09	99.92	100.09	99.92	99.35	100.09	99.92	100.09	99.92	99.35	100.09	99.92	100.09	99.92	99.35	100.09	99.92	100.09	99.92	100.09	99.92	99.35	100.09	99.92	100.09	99.92	100.09	99.92	100.09	99.92	
Ti	0.974	0.944	0.979	0.980	0.966	0.980	0.966	0.979	0.980	0.966	0.980	0.966	0.979	0.980	0.966	0.980	0.966	0.979	0.980	0.966	0.980	0.966	0.980	0.966	0.979	0.980	0.966	0.980	0.966	0.980	0.966	0.980	0.966	
Al	0.009	0.009	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Fe3+	0.008	0.047	0.021	0.013	0.019	0.013	0.019	0.021	0.013	0.019	0.013	0.019	0.021	0.013	0.019	0.013	0.019	0.021	0.013	0.019	0.013	0.019	0.013	0.019	0.021	0.013	0.019	0.013	0.019	0.013	0.019	0.013	0.019	
V	0.009	0.000	0.000	0.007	0.008	0.007	0.008	0.000	0.007	0.008	0.007	0.008	0.000	0.007	0.008	0.007	0.008	0.000	0.007	0.008	0.007	0.008	0.007	0.008	0.000	0.007	0.008	0.007	0.008	0.007	0.008	0.007	0.008	
Nb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Fe2+	0.725	0.838	0.793	0.757	0.741	0.757	0.741	0.793	0.757	0.741	0.757	0.741	0.793	0.757	0.741	0.757	0.741	0.793	0.757	0.741	0.757	0.741	0.757	0.741	0.793	0.757	0.741	0.757	0.741	0.757	0.741	0.757	0.741	
Mn	0.006	0.008	0.006	0.010	0.012	0.010	0.012	0.006	0.010	0.012	0.010	0.012	0.006	0.010	0.012	0.010	0.012	0.006	0.010	0.012	0.010	0.012	0.010	0.012	0.006	0.010	0.012	0.010	0.012	0.010	0.012	0.010	0.012	0.010
Mg	0.283	0.183	0.212	0.242	0.265	0.242	0.265	0.212	0.242	0.265	0.242	0.265	0.212	0.242	0.265	0.242	0.265	0.212	0.242	0.265	0.242	0.265	0.242	0.265	0.212	0.242	0.265	0.242	0.265	0.242	0.265	0.242	0.265	
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Zn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Ni	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Cation total	2.013	2.028	2.010	2.010	2.017	2.010	2.017	2.010	2.010	2.017	2.010	2.017	2.010	2.010	2.017	2.010	2.017	2.010	2.010	2.017	2.010	2.017	2.010	2.017	2.010	2.010	2.017	2.010	2.017	2.010	2.017	2.010	2.017	
Mg No	28.06	17.90	21.08	24.25	26.34	24.25	26.34	21.08	24.25	26.34	24.25	26.34	21.08	24.25	26.34	24.25	26.34	21.08	24.25	26.34	24.25	26.34	24.25	26.34	21.08	24.25	26.34	24.25	26.34	24.25	26.34	24.25	26.34	
XTiO3	97.38	94.38	97.94	98.03	96.57	98.03	96.57	97.94	98.03	96.57	98.03	96.57	97.94	98.03	96.57	98.03	96.57	97.94	98.03	96.57	98.03	96.57	98.03	96.57	97.94	98.03	96.57	98.03	96.57	98.03	96.57	98.03	96.57	98.03
Hematite	0.83	4.75	2.06	1.30	1.89	1.30	1.89	2.06	1.30	1.89	1.30	1.89	2.06	1.30	1.89	1.30	1.89	2.06	1.30	1.89	1.30	1.89	1.30	1.89	2.06	1.30	1.89	1.30	1.89	1.30	1.89	1.30	1.89	
Ilmenite	69.64	76.89	76.86	73.52	70.31	73.52	70.31	76.86	73.52	70.31	73.52	70.31	76.86	73.52	70.31	73.52	70.31	76.86	73.52	70.31	73.52	70.31	73.52	70.31	76.86	73.52	70.31	73.52	70.31	73.52	70.31	73.52	70.31	73.52
Pyrophanite	0.56	0.73	0.54	0.97	1.12	0.97	1.12	0.54	0.97	1.12	0.97	1.12	0.54	0.97	1.12	0.97	1.12	0.54	0.97	1.12	0.97	1.12												

DIAMOND INDICATOR DATA

Sample No: **Composite 2**

Job No: **287**

Date Started: 29/4/99
 Processing Weights
 Initial: 26 kg
 +2mm: 0.059 kg
 After Tabling: 1.568 kg
 After TBE: 4 g +2mm 0 g

Positive

Negative

Positive (Other)

Ø/mm	4 g							+2mm 0 g							
	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3	Fractions Analysed(x), Observed only(o), Scanned only(s)							
Crush								Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1
Table		x	x	x	x	x	x	NM	x	x	x	x	x		
HL	x	x	x	x	x	x		M4	x	x	x	x	x		
Mag		x	x	x	x	x		M3	x	x	x	x	x		

Kimberlite, Lamproite Indicators

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Kimberlitic?
Diamond										
Chrome Diopside										
Chromite										
Phlogopite										
Picroilmenite										
Pyrope										
Diopside					1				1-2	Prob. Not

Detailed Descriptions

Mineral	Size/mm	Description
Diopside	1+0.4	Anhedral, Irregular, Subrounded, Ribbed, Green, Subtranslucent Little or no chrome

Other Minerals (Volume% after Heavy Liquid-HL)

Almandine	T	Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene	A	Magnetite		Monazite	
Grossular		Amphibole	A	Leucoxene	T	Phosphate	
Spessartine		Biotite	S	Pleonaste	F		
		Prehnite		Limonite		Rock Fragments	F
Andalusite		Corundum		Pyrite(psuedo)			
Kyanite		Hematite		Pyrite		Zircon	
Sillimanite		Ilmenite		Barite		Titanite	
Staurolite		Rutile	T	Anhydrite		Topaz	A
Epidote	T	Anatase	T				
Tourmaline	S	Brookite		Magnesite			

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: **LG/JT**

Date Completed: **30/4/99**



Independent Diamond Laboratories Pty Ltd

ACN 005 948 185

34793

DIAMOND INDICATOR DATA

Sample No: **Composite 1**

Job No: **287**

Date Started: 29/4/99							
Processing Weights							
Initial:		57.6 kg					
+2mm:		6.036 kg					
After Tabling:		11.99 kg					
After TBE:		61 g		+2mm:		13 g	
Ø/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	<0.3
Crush							
Table		x	x	x	x	x	x
HL	x	x	x	x	x	x	x
Mag		x	x	x	x	x	

Positive

Negative

Positive (Other)

Fractions Analysed(x), Observed only(o), Scanned only(s)												
Ø/mm	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1					
NM	x	x	x	x	x	x						
M4	x	x	x	x	x	x						
M3	x	x	x	x	x	x						

Kimberlite, Lamproite Indicators

Sieve Size/mm	>2	>1	>0.8	>0.5	>0.4	>0.3	>0.2	>0.1	Wear/km	Kimberlitic?
Diamond										
Chrome Diopside										
Chromite						1			<5	Poss.
Phlogopite										
Picroilmenite					1	4			3-8	See Below
Pyrope										
Diopside				1	1	5			0-5	Prob. Not

Detailed Descriptions

Mineral	Size/mm	Description
Chromite	1+0.3	Subhedral fragment, One slightly concave X'tal face, frosted to submetallic, Cokey fracture.
Picroilmenite A-Poss. Kimb.	1+0.4	Anhedral, Rounded, Pitted, Curved fracture, Brittle.
Picroilmenite B-Prob. Not Kimb.	4+0.3	Anhedral, Rounded, Pitted, Slight cleavage, Probably Mn ilmenite.
Diopside	1+0.4	Anhedral, Rounded to angular with saw tooth terminations, Ribbed, Pale green, Translucent, Cr bearing.
Topaz	1+2	White
Sapphire	2+0.3	Blue
Garnet	≈8+0.5	RI>1.77

Other Minerals (Volume% after Heavy Liquid-HL)

Almandine	O	Orthopyroxene		Spinel		Apatite	
Andradite		Clinopyroxene	A	Magnetite	T	Monazite	
Grossular		Amphibole	A	Leucosene		Phosphate	T
Spessartine	O	Biotite	S	Pleonaste	S	Picotite	T
		Prehnite		Limmonite		Rock Fragments	O
Andalusite		Corundum		Pyrite(pseudo)			
Kyanite		Hematite		Pyrite	T	Zircon	F
Sillimanite		Ilmenite	T	Barite		Titanite	
Staurolite		Rutile	F	Anhydrite		Topaz	P
Epidote		Anatase					
Tourmaline	O	Brookite		Magnesite		Cassiterite	O

P >50% A 20-50% C 10-20% S 1-10% O 20grains-1% F 5-20grains T 1-5grains

Mineralogist/Observer: MES/JT

Date Completed: 4/5/99


Independent Diamond Laboratories Pty Ltd
 ACN 005 948 185 34793

PIONEER

MACRODIAMOND DATA

Sample No:

No. 1 DORSET DREDGE

Job No: 298

Processing Weights	Date Started: 18/6/99
Initial: 34.0 kg	After Tabling 7.334 kg
+4mm: 0.532 kg	After TBE: 1.674 kg
+2mm: 1.794 kg	After X'ray Sort: kg

Positive (Diamond)

Negative

Positive (Other)

Size Fraction Digested:

	>4	>2	>1	>0.8	>0.5	>0.4	>0.3
Mill							
Table			x	x	x	x	x
Mag		x	x	x	x		
HL		x	x	x	x		
X'ray							

Fractions Analysed(x)	Observed only(o)	Scanned only(s)					
Ø/mm	>10	>8	>4	>2	>1	>0.8	>0.5
NM				0		0	
ALL	0	0	0				

Gem Recovery

Sieve Size/mm

>16	>8	>4	>2	>1	>0.8	>0.5
			19	201		

Sapphire/Ruby

Number

Descriptions	>16	>8	>4	>2	>1	>0.8	>0.5
Individual Stone Size/carats							

Total Weight/carats = 10.476ct.

Grade(based on +1mm): 310ct./t

Morphology:	Octahedron						
	Dodecahedron						
	Macle						
	Combination						
	Shape						
	Fragment						
	Twinned						
	Rounded						
	Resorbed						
Colour:	Blue			17	71		
	Red			2	82		
	Black/Brown(Star)				21		
	Yellow/Green(Star)				7		
	Star				26		

Inclusions:							
Background Minerals:	(Non Mag)	Topz	Zm	Spnl	Cdm		
		P	S	S	C		

Comments: Indicators: Sapphire: Only largest weighed(Blue=0.2485ct.).
Blue sapphire is blue to indigo.
Ruby: Strawberry to crimson.
Non Black Star sapphires are blue.

Mineralogist/Observer: JT/LG

Date Completed: 29/6/99



RESEAL